MODERN PLASTICS

APRIL 1948

WHEN Durez phenolic plastics are described as unsurpassed in versatility, this means the manufacturer of electrical equipment and appliances can count on members of this plastics group to fit *his* special needs.

Even within this one field, Durez offers a wide latitude of characteristics. Easy moldability can be had in a lower power factor material for high-frequency parts. Another retains high dielectric strength at elevated temperatures. Still another has excellent electrical properties closely controlled . . . a type widely used for general purposes. All without sacrifice of impact strength or surface luster!

Whenever you are seeking production speed and economy, along with improved performance or appearance in your product . . . or both . . . consider Durez. With our enlarged plant capacity and perfected quality control, we have much to offer you. "Durez Plastics News", which shows each month what other manufacturers are accomplishing with Durez, is available for the asking.

Durez Plastics & Chemicals, Inc., 124 Walck Rd., N. Tonawanda, N. Y. *Export Agents: Omni Products Corp., 460 Fourth Avenue, New York 16, N. Y.*

NO "SPILLING" through molded Durez when you

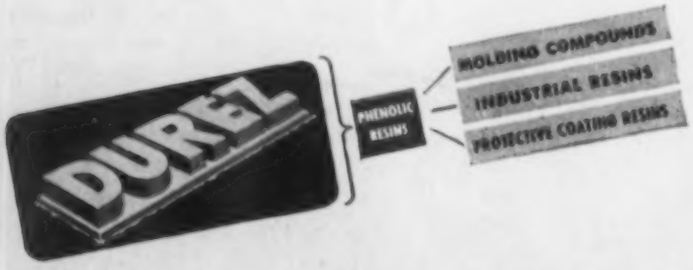
"Pass the Juice"

TRANSFORMER TAP CHANGER. High dielectric strength of the Durez phenolic compound enables these Allis-Chalmers devices to operate at a voltage differential of 15,000 volts at about 50 amps., single phase. Mechanical strength permits heavy spring loading required for positive point contacts. Durez is immune to the hot oil in which tap changer is submerged.

SIGNAL CONTROL UNIT. Normal properties of electrical Durez are all required here . . . dielectric strength, self-insulation, and non-corrosion. Installed along railway lines, these units also possess mechanical stability under wide ranges of atmosphere and temperature.

DISTRIBUTOR PARTS. Made with a Durez compound having excellent arc resistance and a very low shrinkage factor, these parts hold multiple metal inserts and withstand great variations in weather and operating conditions. Durez facilitates production, conforms easily to intricate grooves, holes and bosses in the mold.

HIGH FREQUENCY EQUIPMENT. The Valpey Xtalector permits instant changes from one radio transmission frequency to another. Crystal holders are molded of a Durez compound possessing a high dimensional stability and low electrical loss, assuring maintenance of crystal frequency in extremes of temperature and humidity.



PHENOLIC PLASTICS that fit the job

Catalin...THE FLATTERING COMPLEMENT!

Nothing could be finer! This de-luxe carving set-of-six is from Sears-Roebuck's finest quality "Craftsman" Series.

We are particularly proud to note, that, when the designs and specifications were being drawn for this superlative cutlery service, Catalin, the gem of plastics, was selected as the ideal material for the handles.

Like the choicest steel they complement, these handles represent Catalin's split mold casting process at its very best! The peculiar arching of natural stag, the pronounced and difficult-to-duplicate rugged ridging, together with its sturdy, perfectly balanced feel . . . All were a challenge, and all were achieved!

The true-to-nature appearances of the animal horn were obtained with surface dyes, leaving to fabrication the art of accentuating and polishing the rich Catalin under-tones and end surfaces. Necessary, also, to this application, and apart from its economical casting, were Catalin's physical properties, its structural strength, resistance to hot water, fats and greases, its permanence.

No plastic material can match the beauty of a cast phenolic—and none can compare with the color intensity of Catalin. Decoratively and functionally, it compliments — as it complements!

To insure your pre-eminent satisfaction with Catalin, consult a dependable fabricator—or—feel free to draw, without obligation, upon the services of Catalin's technically experienced staff.

NOTE TO DESIGNERS AND MANUFACTURERS

The Catalin split mold method for casting products with undercuts offers extremely wide latitudes. A data sheet pertaining to this process is available for your review. Inquiries invited!

CATALIN CORPORATION OF AMERICA

ONE PARK AVENUE • NEW YORK, 16, N. Y.

CATALIN

THE GEM OF PLASTICS

Catalin

CAST RESINS • LIQUID RESINS • MOLDING COMPOUNDS

MODERN PLASTICS*

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* Reg. U. S. Patent Office.

Stirrings of the future

NEW GEON paste resins mean simplified molding, casting, coating, and dipping

THE picture you are looking at is *not* an exaggeration.

"Geon Paste Resins" means new things in the vinyl plastics field. A new resin-plasticizer paste can now be prepared by a simple stirring operation. In many applications it will eliminate the need for heavy and expensive milling equipment, grinding, dangerous volatile solvents, and high pressure molding, calendering or extruding operations.

The new Geon Paste Resin can be mixed as simply as you see it done here. Color—any color, brilliant or pastel—can be added. The mixture can be molded, cast, extruded—used for coating and dipping for paper and textiles. Thin, medium, or heavy films can be developed—supported or unsupported. These can be beautifully embossed or printed as simply as those produced by any other process. And in casting, there is virtually no shrinkage in the mold even though no pressure is used. In dipping and coating, usually only *one* operation is called for. Yet Geon Paste Resin results in a tough, homogeneous, and flexible body.

From packaging to luggage, upholstering to shoe soles, toys to large electrical cables, Geon Paste Resin will make its contribution. We make no finished products from Geon or from any of our other raw materials. However, we are glad to work on special problems or applications. And we believe you will want the bulletin just published on Geon Paste Resin. To receive it, please write to Department O-4, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, O.

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EDITORIAL

Instilling Confidence

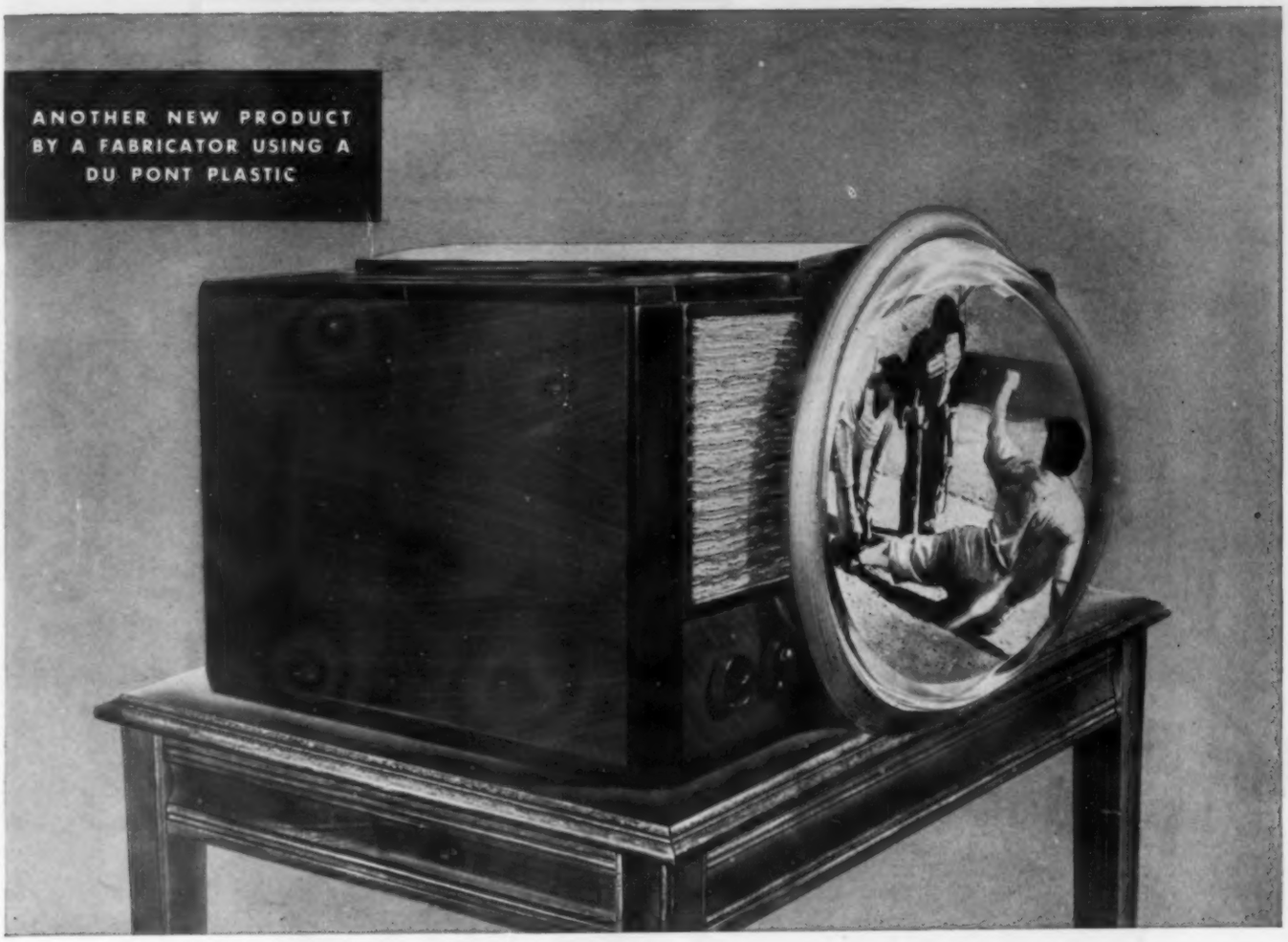
Another step forward in the plastics industry's efforts to put the right plastic in the right place and thus gain more public confidence in plastics has been taken by The Dow Chemical Co. That company recently announced a program (see page 121) to grant permits for use of its Styron trademark only on products that have been satisfactorily tested for performance in its own technical laboratories.

Other raw materials companies have made considerable effort to upgrade their customers' products by withholding use of their trademark in certain cases and by aiding molders and processors with technical assistance, but we have no report of any other formally organized effort that includes buyers and consumers as part of a panel which is to decide that a molded plastics product is satisfactory and suitable for the job it is intended to do.

It was inevitable that the time would come when the raw materials companies would find a way to protect their reputation for providing quality merchandise. There have been too many examples of poor workmanship and the use of plastics in applications where they didn't belong. The Dow decision to approve only those items which meet buyer and consumer approval is a progressive move which has reportedly met the approval of every molder who has submitted samples, even though his request to use the trademark may have been denied. Everyone concerned is cognizant of the fact that when a given trade name attains public confidence, all the problems of merchandising goods carrying that name are tremendously lessened.

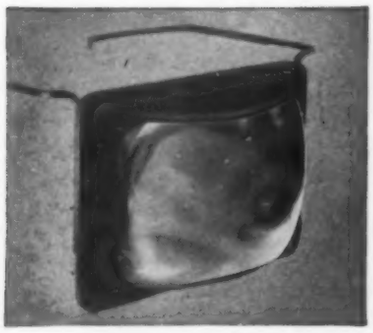
Dow officials admit that they cannot carry the load alone. Apparently they are not too certain that unified action by the entire industry can be attained at an early date and are frank to acknowledge that much more labor is to be done before complete success in upgrading all plastics products is obtained. Their program is in no sense a complete solution of the informative label campaign which we still believe must be brought to fruition as quickly as possible. Dow's trademark campaign is more an attempt to gain public confidence in products made from their material; their trademark is simply a label telling what that material is, with an implied confidence that it will meet the consumer's need.

There are still two other types of labeling needed. One should tell how to use the product and what it will do. Another should tell how to care for it. We understand that the S.P.I. committee studying the informative labeling situation is making progress and will soon come forth with recommendations. That day cannot come too soon—provided the recommendations are practical and that the industry will take action to put them into effect.



TELEVISION LOOKS BETTER THROUGH "LUCITE"

Liquid-filled lens of Du Pont plastic magnifies up to 2½ times . . .
makes television image visible to a large audience



Attachable television lens shown above made by Hesco Products, Inc., Chicago, Illinois

MANUFACTURERS of other types of magnifying lenses also use Du Pont "Lucite." The plastic is excellent for flawless, curved surfaces. "Lucite" is crystal-clear . . . transmits up to 92% of light . . . can "pipe" light around corners. And its light weight and strength permit a wide variety of designs for both fabricators and molders.

Here's more pleasure for more people with television sets. This new lens gives a clear image enlarged up to two and one-half times! Reason? A hollow lens of "Lucite" is mounted in front of the picture-tube. Filled with a clear oil, it enlarges the image and reduces eyestrain.

In developing television lenses, manufacturers needed an optically clear material—light in weight, durable, and able to withstand temperature changes without cracking. They found all these qualities and more in "Lucite" acrylic resin. "Lucite" has unusual optical properties, resists breakage, has high tensile and flexural strength and is easily formed into curves.

More and more manufacturers are turning to Du Pont "Lucite"—for smart packaging, eye-catching signs, and other improved products. It's available in many colors—transparent, translucent or opaque. And "Lucite" is readily fabricated or molded.

Perhaps *you* can profit with Du Pont "Lucite" or another Du Pont plastic . . . in developing a new product or improving an old one. Write for literature, E. I. du Pont de Nemours & Co. (Inc.), Plastics Dept. Room 364, Arlington, N.J.

Lens illustrated made for Liquid Lens Corporation by Plastic Pioneers, Inc., both in Jamaica, N. Y.

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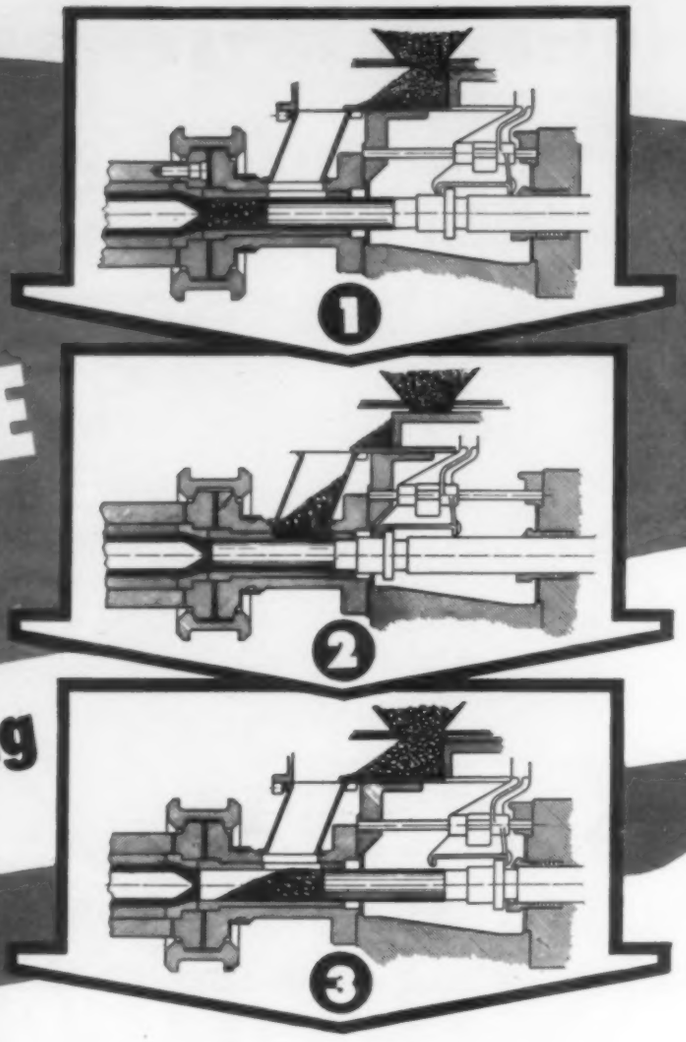
for MORE Molding Production!



MODERN manufacturing requirements call for maximum production from all equipment! Reed-Prentice Plastic Injection Molding Machines are designed to provide faster production without sacrificing quality of the molded pieces. This is accomplished by speeding the machine cycle without affecting the sensitive timing controls so essential to the proper injection and molding cycle.

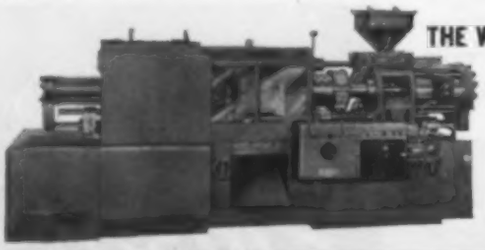
Figure 1 shows how this increased machine speed is attained. The injection plunger has advanced 4" after its return stroke, has compressed the material at the heater entrance prior to injection, thus shortening the injection stroke by one half.

Figure 2 shows the plunger fully advanced, making the injection stroke. Note that the material for the next shot is now in the chute above the plunger, ready to drop into the plunger sleeve on the return stroke.

Figure 3 shows the plunger at its full return position, ready to compress the material into the "ready to inject" position as shown in Figure 1, while the molding cycle is still in the "dies closed" period.

This simple but effective design feature will give you a saving up to as much as two seconds on the machine cycle . . . and is standard equipment on all new machines of 8 Oz. capacity and over . . . can be applied to all 10D machines now in use.

Address your inquiries for full information about Reed-Prentice machines of 4, 8, 10, 12, 16 and 24 Oz. capacities to Department D.



THE WORLD'S LARGEST MANUFACTURERS OF INJECTION MOLDING MACHINES

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Housing molded by
Chicago Molded Products Corp.

TOUGH LUMARITH*

Once a day, sometimes twice . . . 365 times a year every year of a long service life, every component part of the Sunbeam Shavemaster is expected to perform at top efficiency. There's no place for any material but the best!

The housing of the Shavemaster is injection molded Lumarith—a cellulose acetate formulation especially selected for its superior *flame resistance* and *form retention*. The switch from a thermosetting plastic to Lumarith, gives this housing rugged toughness and a touch-perfect surface that constant handling only improves.

Have you a product headed for continuous hard use? Don't overlook the advantages that Lumarith and the other Celanese cellulosic plastics offer:

unexcelled toughness and flexural strength
full color range and wear-loving surface

and production shortcuts:

no buffing . . . no tumbling . . . no painting
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just fast-cycle injection molding, and the part is ready for assembly. Call your Celanese representative. Through him, you will get expert technical and practical advice. CELANESE CORPORATION OF AMERICA, Plastics Division—Dept. D-1, 180 Madison Avenue, New York 16, N. Y.

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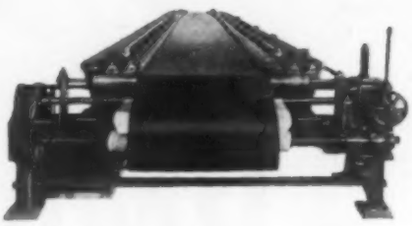
ELIMINATE WRINKLING IN WINDING OPERATIONS

The Van Vlaanderen Expander will enable you to wind synthetic fabrics, sheets and films at top speeds without wrinkling. It can be fitted to almost any machine and will save winding costs, produce tighter, smoother finished rolls.

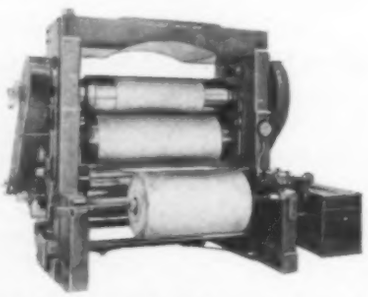
The Expander, like all the equipment listed below, was developed with a background of many years' experience in the textile machinery field. Many of the machines listed are suitable for processing of synthetic fabrics, film and sheeting.

If you have a processing problem and you would like to get production under way months sooner, consider utilizing our standard equipment. To get prompt help, write us about your problem and send a sample of the material you are processing.

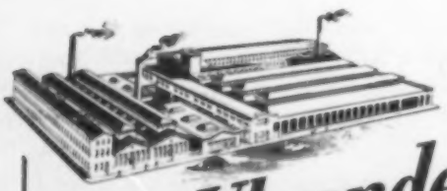
USE THESE STANDARD MACHINES FOR SYNTHETIC FABRICS



TENTER FRAME. Tenter frames are available with or without heat units. These are excellent for stretching and orienting extruded, calendered or cast sheets or film. They can also be used on drying machines following coating operations.



CALENDERING. Calendering machines for synthetic fabric processing are available in many different types and all tonnages. These machines work exceptionally well for chloride monofilms and Saran. All are designed for cold or hot calendering by steam or gas.



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Compression Mold Assembly from DME standard parts

Standard DME Stripper Plate Mold Base

An improved steel now made available to you after many years of extensive research by our engineering staff. This new DME No. 2 Steel is, without question, the finest steel obtainable anywhere for mold bases as well as for cavities for plastic molds and zinc die-casting molds.

DME No. 2 is a medium carbon, oil hardening alloy steel specially compounded for DME and heat treated for maximum ease in machining consistent with extreme hardness and toughness. The superiority of this steel is amply proven by the fact that it will take over three times the load of ordinary warehouse low carbon plate without permanent deformation.

This steel is carried in stock at 225 Brinell. With further heat treating its hardness can be increased to over 300 Brinell with very little or no loss in ease of machining. Whenever extra hardness or toughness in mold bases or mold parts is required, we recommend the use of DME No. 2. You'll find it will more than pay for itself in greatly lowered mold maintenance costs.

A FEW OF THE MANY ADVANTAGES OFFERED BY THIS NEW STEEL:

- √ Embodies Chromium and Vanadium
- √ Improved Hardenability
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- √ Easily Machinable
- √ Resists "Heat-Checking"

Write or phone nearest DME office today for full details of the new, improved DME No. 2 steel.

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HERIBERT, INC. also makes HERIBOL*, a group of special inks for beautiful prints on polyethylene, Saran and Pliofilm. HERIBOL inks can be supplied in a full variety of colors. Check the coupon now for a sample swatch printed with HERIBOL.

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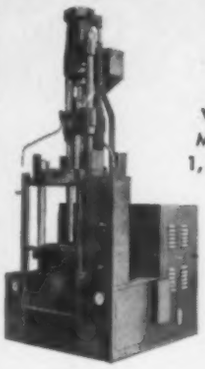

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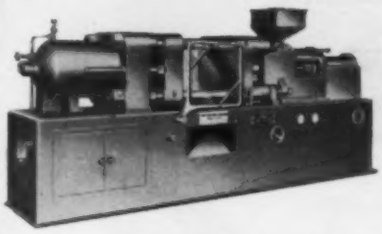
Molding Machines
1, 2, and 4 Ounces



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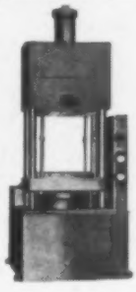
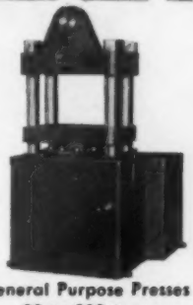
Tableting Machines
—10 and 100 Tons



Transfer
Molding Machines
30 to 1200 Tons



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❶ The world's most complete, standard line of hydraulic plastics molding equipment.

❷ 100 years of experience in building hydraulic machinery.

Only Watson-Stillman can offer you a complete, standard line of equipment that can meet almost every molding need—no matter what method, no matter what plastic material you want to use. And, in addition, Watson-Stillman gives you the benefit of their experience gained through 100 years in building hydraulic machinery. So to get modern production speed and efficiency, ease of operation and maintenance plus the cost advantages of standard design, specify W-S equipment.

The W-S line includes horizontal and vertical injection machines, transfer machines, compression presses, laboratory presses, automatic tableting machines, hobbing presses, record presses and general purpose presses.

Ask W-S for scientific advice in solving your molding problems, without obligation. Detailed information on all machines sent on request.

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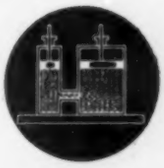
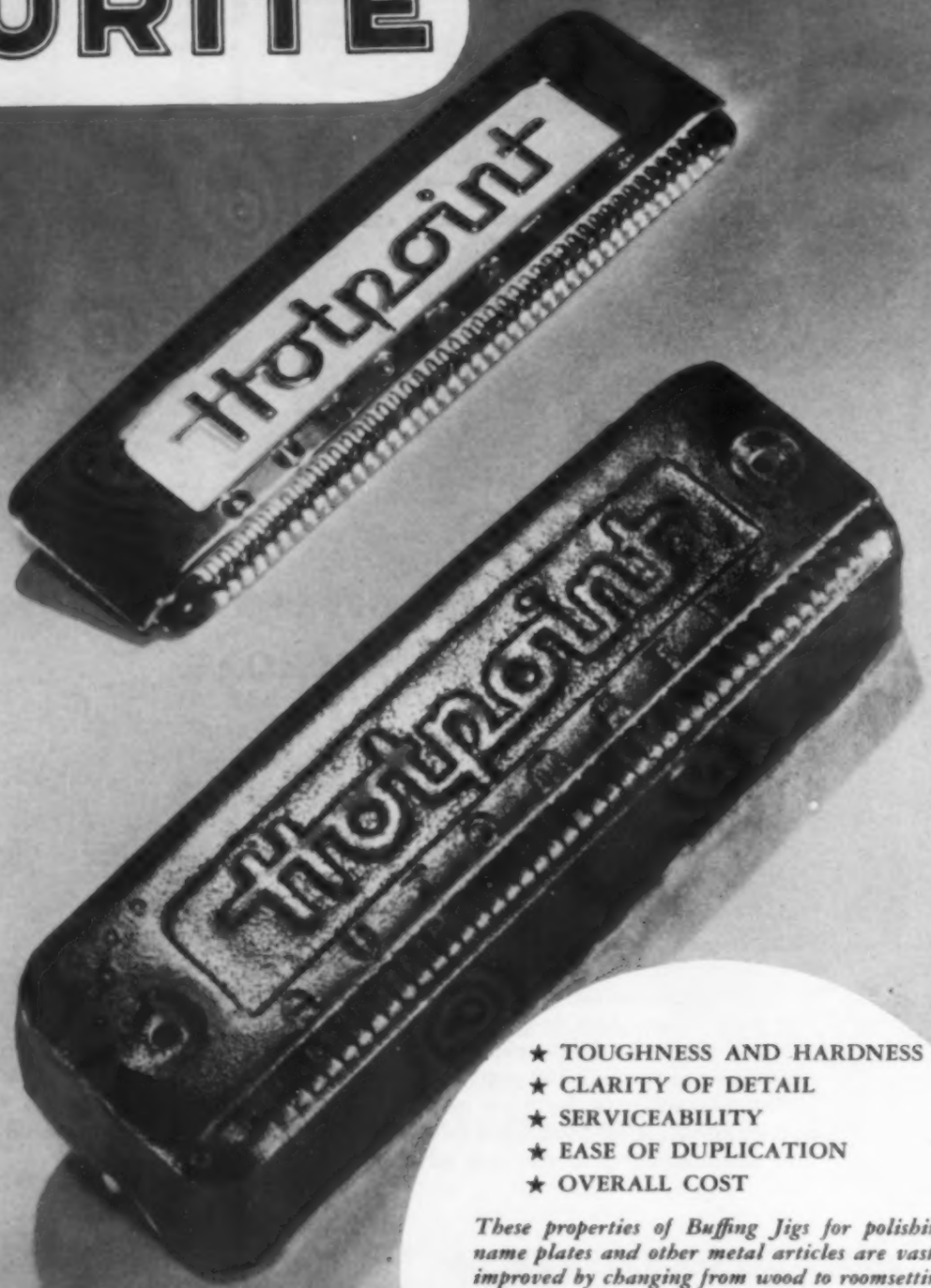


W-S "COMPLETELINE"

Vertical Injection Machines.....1, 2 & 4 oz.
Horizontal Injection Machines.....8 to 80 oz.
Compression Molding Machines....50 to 1200 ton
Transfer Molding Machines.....30 to 1200 ton
Tableting Machines.....10 and 100 ton
Laboratory Presses.....10 to 200 ton
Hobbing & Die Sinking Presses....200 to 3000 ton
Preformers • Plasticizers • Laminating and Polishing Presses • Record Presses

DURITE



★ TOUGHNESS AND HARDNESS
★ CLARITY OF DETAIL
★ SERVICEABILITY
★ EASE OF DUPLICATION
★ OVERALL COST

These properties of Buffing Jigs for polishing name plates and other metal articles are vastly improved by changing from wood to roomsetting DURITE Resin-Plaster of Paris compositions which eliminate costly tooling operations. Write for Bulletin 24 B.

DURITE PLASTICS

DIVISION OF THE BORDEN COMPANY

5000 SUMMERDALE AVE., PHILADELPHIA 24, PA.

★

Every day we are asked to do the impossible in plastics molding, and we try, with a resultant marked degree of success.

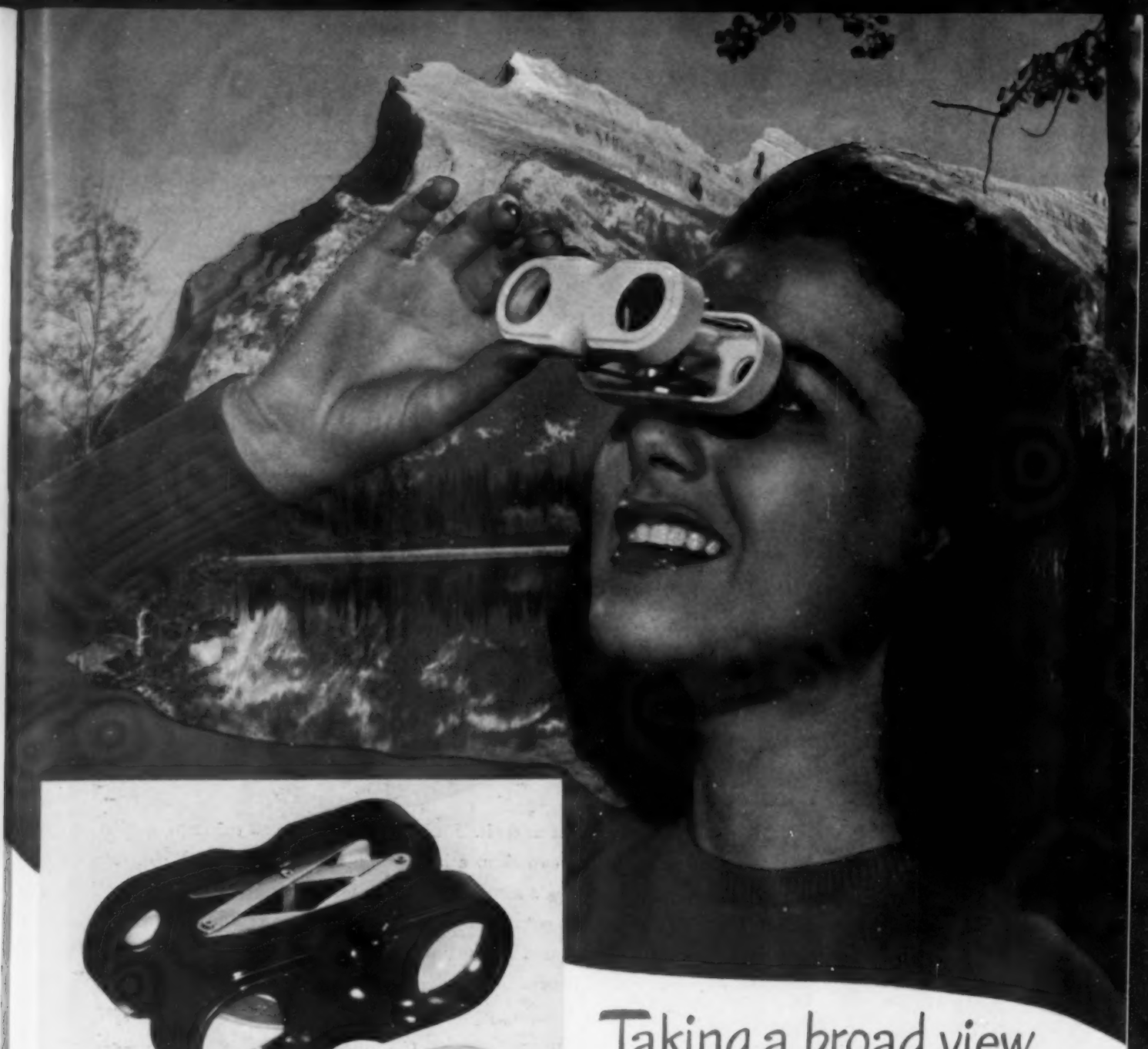
GMP accomplishments in the plastics molding industry are indicative of an unswerving effort to serve our customers intelligently, faithfully and economically.

GMP will try, and try, and try—when a complex plastics molding problem requires a solution.

MOLDERS OF PLASTICS

GENERAL MOLDED PRODUCTS · INC.

OFFICE AND PLANT DESPLAINES, ILL. SUBURB OF CHICAGO



Porto-Sight Binoculars Molded for Porto-Sight Company, Kansas City, Mo.

Kodachrome of Banff, Alta., courtesy Canadian Pacific Railroad Co.

Taking a broad view in Plastics

These Porto-Sight binoculars for which we molded both lenses and housings are a striking illustration of our ability to skillfully create new plastic products. Here was a new idea—planned to fill a long standing demand for lightweight, pocket size binoculars. To create such a product, our engineers and molding technicians had to solve difficult new problems in weight, functional stability and optics.

Thus we succeeded in producing sturdy binoculars weighing less than 2 ounces and with the highest optical power of any within a similar price range.

We have developed a special technique vital to the success of any new plastic product: This technique results in our ability to choose *correct* plastic materials and to mold them skillfully and at low unit production cost.

Our knowledge can help you turn your ideas for new plastic products into profitable reality. Take the first step toward those profits—consult us today. No obligation of course.

Write on your letterhead for the new Injection Molded and Extruded Plastics catalogue. Or, for detailed information about [redacted]* pipe, tubing and fittings, write for circulars containing data and illustrations.

*Trademark Reg.

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Plexiglas, Nylon, Polystyrene, Styron, Lustron, Loalin, Vinylite, Geon, Plexene, Polyethylene, Cerex, Forticel, [redacted]*, Saran, and other Thermoplastic Materials.

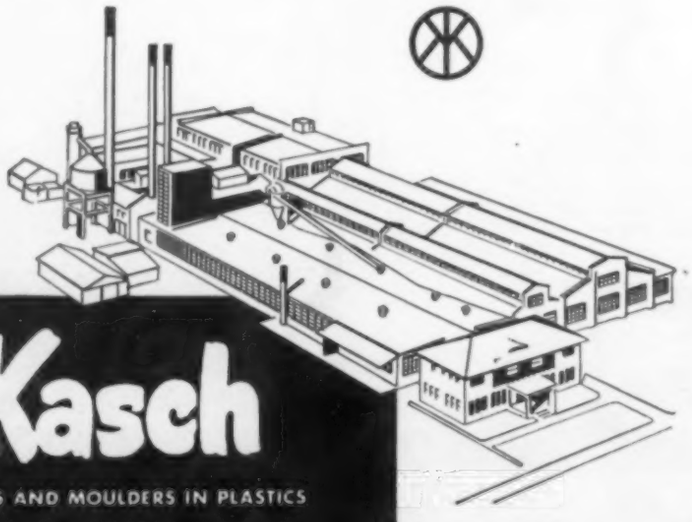
153 WEST HURON STREET • CHICAGO 10, ILLINOIS

Put 'em together Right

...and there's your plastic part!

Better yet, let *us* do it. Timing and executing all the steps that go into plastic production calls for an experienced hand. So it's no puzzle to us. We're veterans in the industry—we can show you a nice bright accomplishment record along with a long list of satisfied customers—we've got the plant, personnel and equipment to do a good job at a fair price—and we're interested in your business.

We offer a self-integrated, dependable source for plastics—complete from design and engineering to cost-conscious finishing equipment. If you've got a compression, transfer, or plunger moulding job, look us up. Question our old customers—or let a Kurz-Kasch sales engineer give you the story.



Kurz-Kasch, Inc., 1415 S. Broadway, Dayton 1, Ohio
BRANCH SALES OFFICES: New York, *Lexington 2-6677* Chicago, *Harrison 5473* • Detroit, *Randolph 5214* Los Angeles, *Prospect 7503* • Dallas, *Lakeside 1022* St. Louis, *Rosedale 3542* • Toronto, Canada, *Adelaide 1377*. **EXPORT OFFICES:** 89 Broad Street, New York City, *Bowling Green 9-7751*.

Kurz-Kasch

FOR OVER 31 YEARS PLANNERS AND MOULDERS IN PLASTICS

LEAROK ... LEA METHOD

A Finishing Job

on HEMCOWARE

HEMCO PLASTICS

cup buffed inside and out

The Hemco Plastics Division of The Bryant Electric Company, volume molders and manufacturers of the famous HEMCOWARE line, find LEA Methods and LEA Compositions a valuable aid to speedy, economical and attractive plastics finishing. In this case, LEAROK is used because the abrasives and lubricant are particularly suited to plastics. On some other articles, the company uses LEA COMPOUND, the greaseless composition.

If you have a problem in the removal of sprues, fins, residual flash or in high lustre color buffing Lea may have the answer. Our technicians will be glad to make tests on your products and submit recommendations.

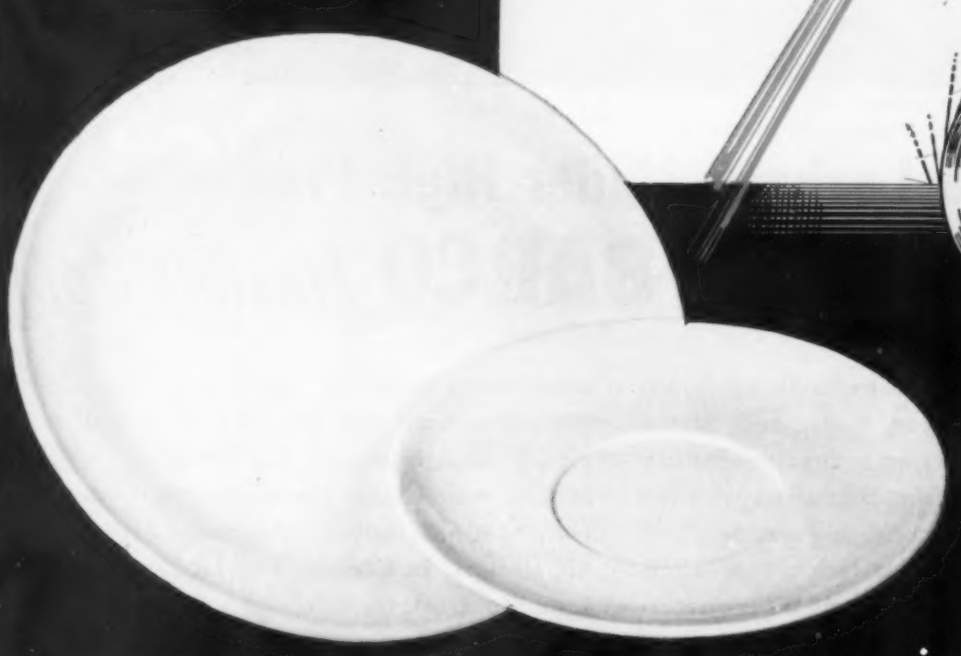
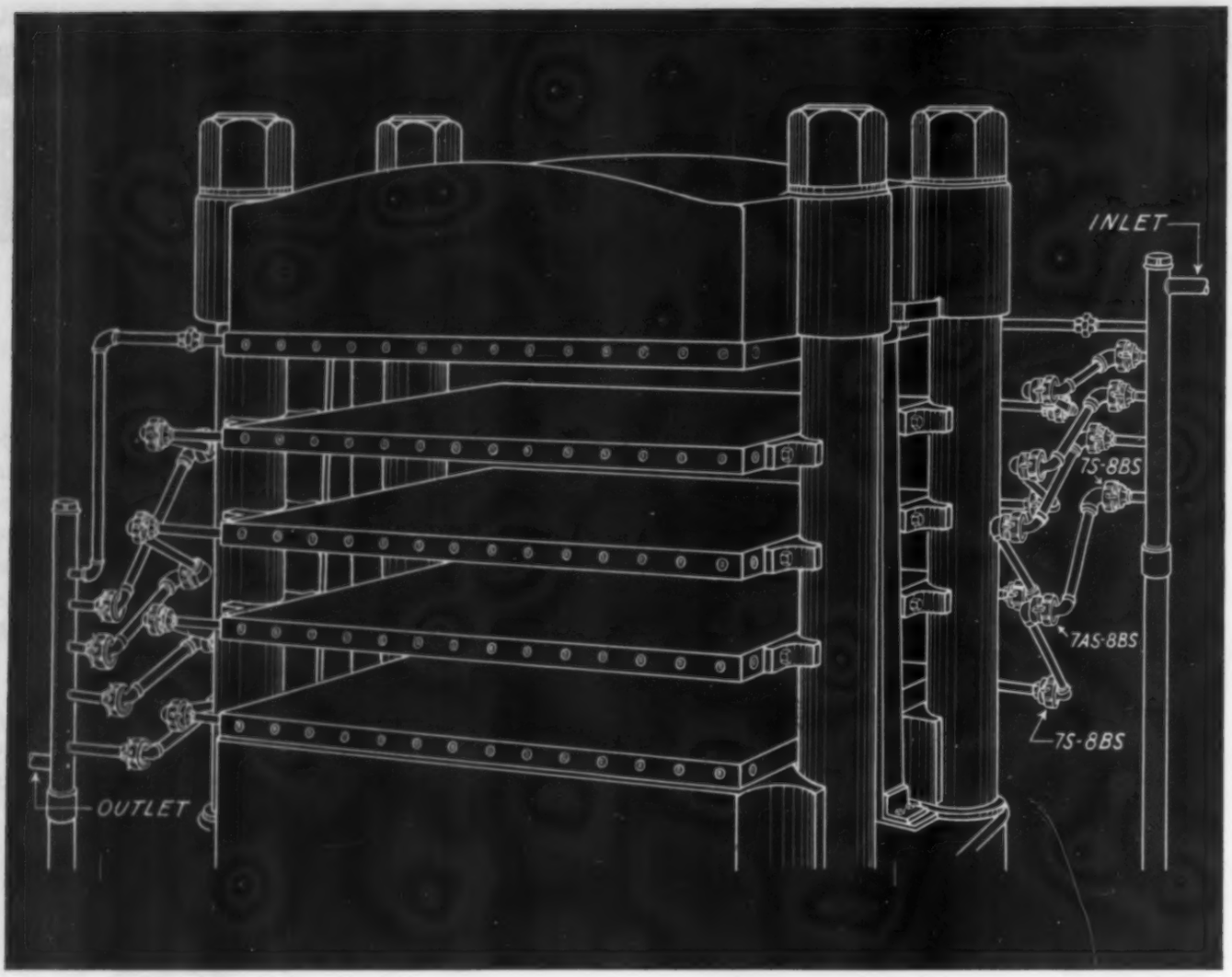


plate and saucer top surface buffed

THE LEA MANUFACTURING CO.

Burring, Buffing and Polishing... Manufacturers and Specialists in the Development of Production Methods, Equipment and Compositions

16 CHERRY AVENUE • WATERBURY 86, CONN.



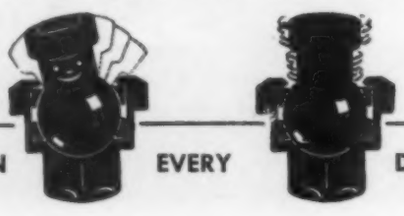
For No Leakage Under High Pressure This Platen Press Uses BARCO *Flexible Joints*

Practically every type of hydraulic machines, cylinders, die heads, rolls, and platen presses—under suction or pressure can use Barco Flexible Joints. Barco provides the flexibility that fluid-conveying systems need. These Joints will not leak under alternating steam and cold water. Where necessary, Barco provides 360 degree swivel movement with side flex to take care of piping misalignment. For more information, write Barco Manufacturing Company, 1809 Winnemac Avenue, Chicago 40, Illinois. In Canada: The Holden Co., Ltd., Montreal, Canada.

BARCO ***FLEXIBLE JOINTS***

Not just a swivel joint ...but a combination of a swivel and ball joint with rotary motion and responsive movement through every angle.

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY



"MOVE IN EVERY DIRECTION"

Exactly what can you expect from *Fire-Resistant Resproid?*

"FIRE-RESISTANT" is a very indefinite term — you know that as well as we do.

But there are certain facts to know about the *Fire-Resistant* type of *Resproid* that will help you determine just how resistant to fire this lovely material is.

First, this type of *Resproid* is specially compounded to resist quick combustion. It will burn if held in direct contact with flame, but slowly enough to afford a high degree of safety.

Second, samples of *Fire-Resistant Resproid* have passed the California State Law setting the minimum fire safety standards for wearing apparel.

Third, *Fire-Resistant Resproid* has been tested by the Good Housekeeping magazine laboratories and given their Seal of Approval.

Besides its big safety feature, *Fire-Resistant Resproid* is made to resist cracking, fading, scuffing and abrasion — most acids, alkalies, oil, alcohol and grease. Its beauty is practical anywhere because dirt can be wiped off in seconds with just a damp cloth.

If you're not already familiar with this type of *Resproid*, send for samples of this lovely, durable material now. You'll find it adds new sales appeal to aprons, curtains, belts, waterproof garments — wherever you use it. Respro Inc., Cranston 10, Rhode Island.

Resproid

Guaranteed by Good Housekeeping

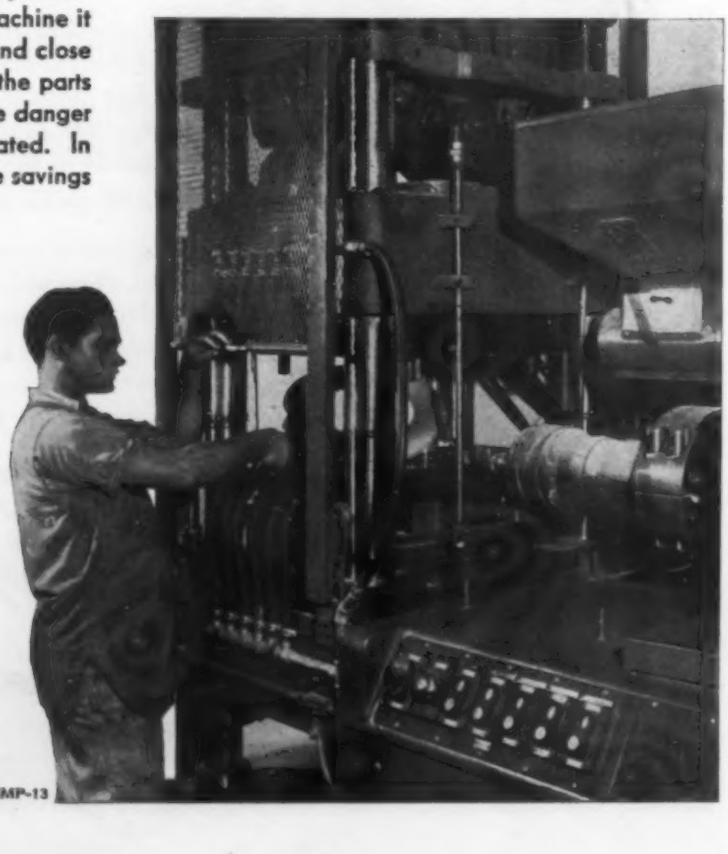
Be sure to identify all your FIRE-RESISTANT RESPROID products with the special yellow and black tag carrying the words, "Resproid—Fire-Resistant". The big, new advertising campaign in Good Housekeeping makes the RESPROID label an important selling point for you.

mold them faster, better, more economically on Impco machines

... A high proportion of the toilet seats now being molded are produced on Impco machines.

Federal Seat Corporation, New York City, selected the Impco V822A machine because it was particularly well suited for the job. With this machine it was possible to gate the parts in the rear and close to the nozzle of the machine. By gating the parts in the rear instead of in the center the danger of "sunburst" patterns was eliminated. In addition there were considerable savings in finishing costs.

More and more molders are turning to Impco for better machines and better service. If you want to mold a better product faster and more economically our engineers are at your service.



Impco

MOLDING MACHINES

PLASTIC MOLDING MACHINERY DIVISION
Improved Paper Machinery Corporation
NASHUA, NEW HAMPSHIRE

MP-13

Just give us your rough idea
. . . we'll do the rest!

consult Celluplastic

for complete service and top performance in

EXTRUSION and INJECTION MOLDING

Whatever your problem, whatever your product, Celluplastic can relieve you of most of your production worries. You need not give us detailed specifications, unless you so desire. Simply tell us what you have in mind, and we'll quickly furnish you with designs, blueprints, perspective drawings, etc. We'll engineer your product, submit samples and quotations. We will mold, assemble and ship.

It goes without saying that we will meet your most exacting requirements. As pioneers and specialists in plastics since 1919, we have been turning in one top performance after another — for thousands of leading business organizations. Our plastics plant is one of the world's finest. We work in every thermoplastic material. *Contact Celluplastic today.* Descriptive literature and further information on request.

EXTRUSION MOLDING

We have the equipment to handle a vast variety and volume of special and standard shapes. We mold rods, tubes, belting, strips, ribbons, sheets, furniture webbing, etc., etc. What can we do for you?

INJECTION MOLDING

We have machine capacity up to 22-ounce shots. We handle everything from small parts to large, cabinet-size surfaces. Let us produce *your* next injection-molded product.

ALSO AMERICA'S #1 SOURCE FOR PLASTIC CONTAINERS

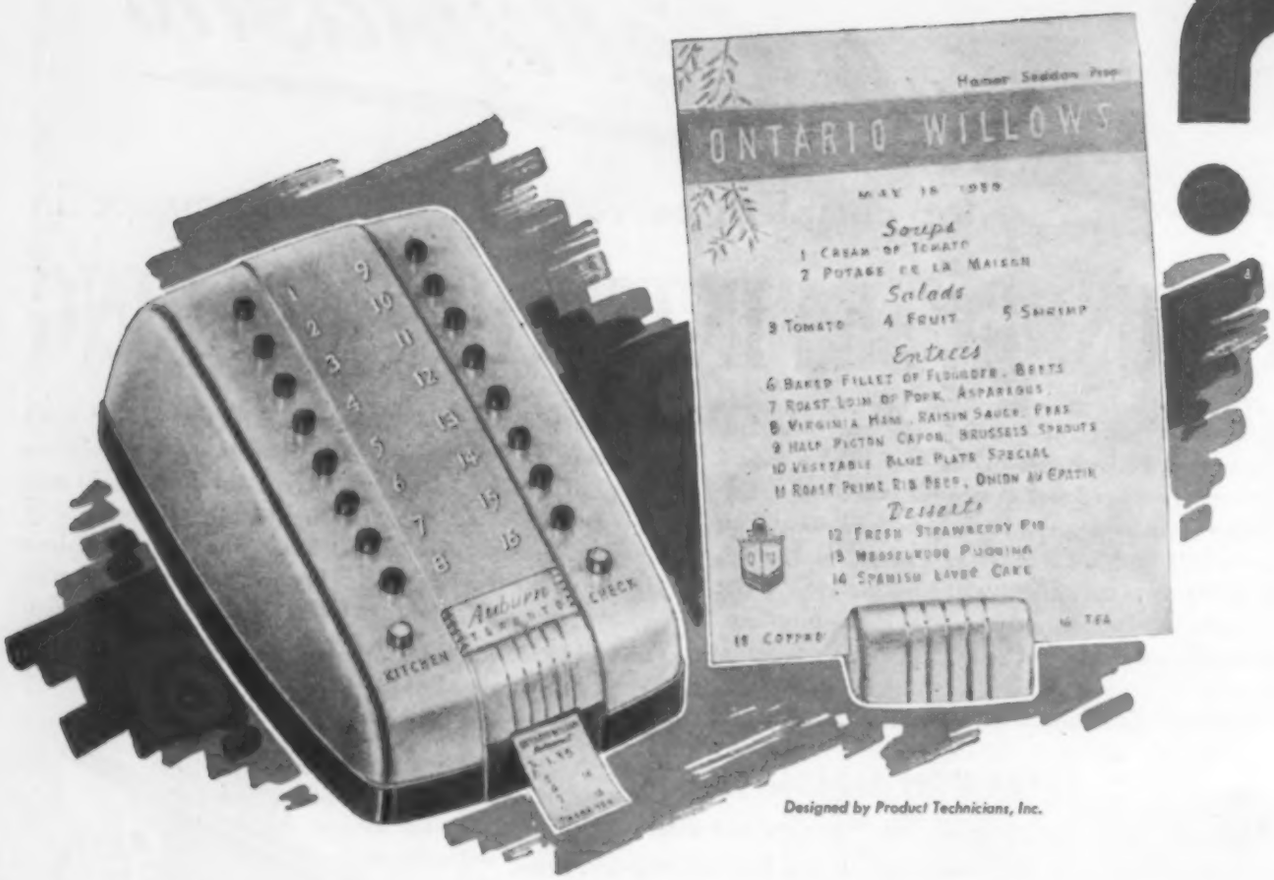
Celluplastic Corporation

50 AVENUE L, NEWARK 5, N. J.

PLASTIC CONTAINERS
EXTRUSION AND INJECTION MOLDING

New York office: 630 Fifth Ave., Circle 6-2425. Representatives: C. Civita & Co., 2 W. 45 St., New York City. Dygert & Stone, Inc., 36 St. Paul St., Rochester, N. Y., Allen-Nelson Co., 603 Boylston St., Boston • J. E. McLaughlin, 401 Lock St., Cincinnati • L. T. Swallow & Assoc., Boulevard Bldg., Detroit • Packaging Industries, 919 N. Michigan Ave., Chicago • Marvin Yates Co., Arcade Bldg., St. Louis • Container Service Co., 1266 Northwestern Ave., Los Angeles • Plastic Supply Co., University Tower, Montreal, Canada • Manuel Leon Ortega, 9a Hamburgo No. 218, Mexico, D.F.

ELECTRONIC WAITRESS... FOR RESTAURANTS IN 1950 ?



Designed by Product Technicians, Inc.

● When, and if, restaurants mechanize their order-taking with a push button unit connected to their kitchen, our Auburn engineers will help determine whether it is a job for plastics. If it is, Auburn's unlimited facilities will guarantee that it is molded of the right plastic . . . . by the most efficient molding method.

Today, when you are concerned with the design of a new product or the re-design of an old one . . . and plastics may be indicated . . . consult with our engineers in the *early* planning stages. They can save you time and money . . . and eliminate production difficulties later.

Whenever you have a problem in plastics, write or call: Auburn Button Works, 600 McMaster St., Auburn, N. Y.

COMPRESSION, TRANSFER AND INJECTION MOLDING • AUTOMATIC ROTARY MOLDING FOR MASS PRODUCTION • EXTRUDED VINYL OR ACETATE TUBES AND SHAPES • MOLD ENGINEERING AND COMPLETE MOLD SHOP.

MOLD MARK

Engineered Plastics

Auburn Button Works, Inc.

MOLDERS SINCE 1876 • AUBURN, NEW YORK

OFFICES: NEW YORK AND CHICAGO, *REPRESENTATIVES:* NEW ENGLAND, PHILADELPHIA, CLEVELAND, DETROIT, SAN FRANCISCO

Announcing— 4 NEW FEATURES

1. *Spreader* added to heating cylinder cuts heating cycles up to 50%.
2. *Hard Chrome Plating* of interior of cylinder cuts resistance to flow of materials, protects against corrosive compounds.
3. *New Relief Valve*—set at 1500 P.S.I.—insures maximum clamping pressure always, permits separate adjustment of injection pressure.
4. *New Needle Valve* increases gage life, by allowing gage to be shut off except for periodic checks on pressure.

SAME LOW PRICE

The Improved
VAN DORN Plastic Press

With the addition of these four new features, this Van Dorn Press is *unequalled* in the 1 oz.-capacity class for molding practically all thermoplastics including nylon. This remarkably economical press—

Costs under $2000

Operates 8 hours for under a dollar

Uses less expensive molds

Can be set up by one man in 20 minutes

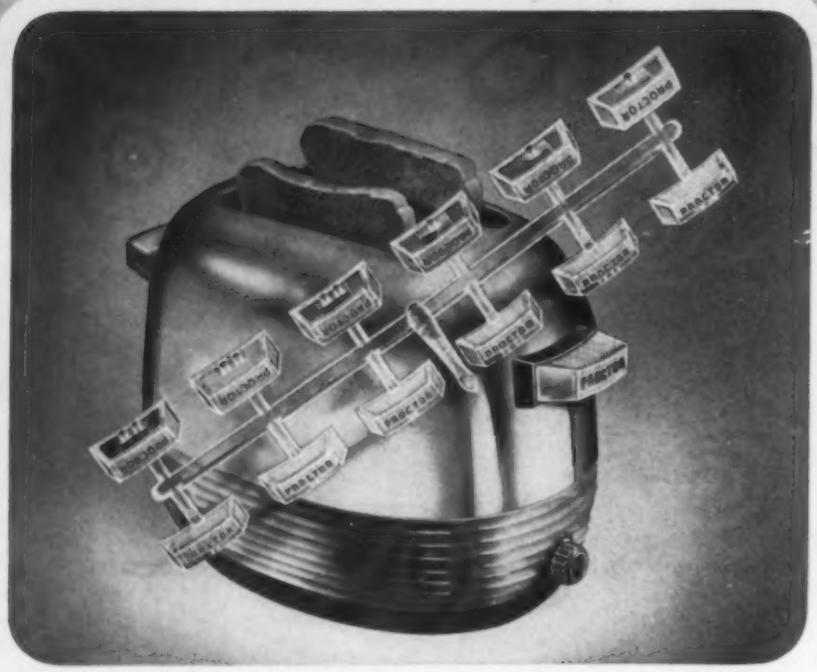
This Van Dorn Injection Press is unexcelled for profitable production of small parts, and "pilot" or experimental runs on bigger jobs.

We make mold bases for Van Dorn Presses.

THE Van Dorn IRON WORKS CO.
2687 EAST 79th STREET • CLEVELAND 4, OHIO

FREE BULLETIN tells all the facts. *Write for it.*

BEAUTY DOWN TO THE FINGERTIPS



Appearance is the sum of many details — especially in an electrical appliance like Proctor's deluxe toaster. Gleaming chromium sets the motif, but for maximum effect under the careful scrutiny of the consumer, a small part like a plastic knob counts heavily, too.

To obtain the top quality desired, Proctor had Shaw mold the knobs. Leading companies like Proctor know that Shaw delivers. Injection molded with a 12-cavity mold, the knobs are made of a highly heat-resistant methacrylate, a crystal clear plastic pleasing to the eye and touch.

On your next plastics molding job, do as Proctor did — have Shaw do it.

SHAW

SHAW INSULATOR COMPANY

MOLDERS QUALITY MARK ON MOLDED PLASTICS SINCE 1892

160 COIT STREET IRVINGTON 11, N. J.

PLASTICS LITERATURE AVAILABLE

Shaw engineers have prepared a variety of literature, study of which might help you to a decision. Simply write a note about what phases of plastics especially interest you.

Or, you may prefer at once to call in a Shaw engineer, and present your problems for his study. This company's fifty-five years of plastics experience gives him a rich background from which you can draw.

Between the resources of Shaw and the Plax Corporation, Hartford 5, Conn., you can obtain assistance in almost all plastics methods and materials.

THIN METHACRYLATE SHEET IS HERE

Add another first to Plax's long list of innovations. This time it is methacrylate sheet that is really *thin.* It is available now and you can order for immediate delivery. Thicknesses range from .010" through .045."

You know methacrylate — its crystal clarity, brilliance of finish, dimensional stability and durability. Well, here are these advantages under your hand for the first time in *thin* sheet form. You can have it run-of-mill or press polished.

You probably have had all sorts of ideas for a material like this. It lends itself admirably to numberless applications like boxes, radio dial coverings, spacers, watch crystals, other drawn parts, light louvres, etc.

CHART ON "HOW TO USE PLASTICS"

Now available for the asking is a table of properties for six materials available from Plax in various forms and formulae. This has been incorporated in the Plax catalog, which also contains helpful information on the primary uses of each material.

A copy will be sent promptly upon receipt of your request.

Between the resources of Shaw Insulator Company, Irvington 11, N. J., and Plax Corporation, Hartford 1, Conn., you can find help on virtually every material and method in plastics today.

PLAX
FOR PLASTIC SHEET, ROD & TUBES
NOT SUBSTITUTES···IMPROVEMENTS

P. O. BOX 1019 ★ HARTFORD 1, CONNECTICUT
In Canada — Canadian Industries, Ltd., Montreal

Only PHILLIPS

RECESSED HEAD SCREWS

have driver sizes engineered in balance with ALL screw sizes for PRACTICAL PRODUCTION DRIVING

Phillips Practical Engineering, based on exhaustive tests of actual driver requirements on the assembly job, proved 4 sizes of recesses and drivers the fewest possible for dependable efficiency in driving the complete range of sizes of cross recessed head screws.

One Driver Size is adequate for most jobs, however, because the great majority of production assemblies use screws in the Phillips No. 2 recess and driver size range.

About 25% of Screws used in production assemblies are bigger than those in the popular No. 2 size range. 20% have Phillips No. 3 size recess, and the proper balance essential to efficient driving is provided by the Phillips No. 3 size driver.

For the Few Heavy Duty screws used, (5%), you need a driver and recess size balanced to obtain the required torque and fastening security, — Phillips No. 4. Using a driver suited to smaller screws is like using a tack hammer on a railroad spike.

For Small Size Screws, you want a small driver (No. 1) in proper *balance* to prevent overdriving, stripping threads, or straining screw head. You wouldn't use a driver big enough to drive a ½" diameter screw, any more than you'd use a sledge hammer to drive a tack.

Phillips Screws not only promise, but *deliver* all the advantages of cross recessed head screws. Ask for Phillips when you order.

OF ALL SCREW SIZES USED IN INDUSTRY—

DRIVERS AND BITS SHOWN HALF SIZE — RECESSES ACTUAL SIZE

THE PHILLIPS DRIVER AND SCREW are in perfect balance, whatever the size. Less than 4 recess and driver sizes would have meant weakened heads in some screw sizes — would have encouraged overdriving to weaken the screw, or underdriving to lessen assembly strength.

By varying the length and diameter, the same balance is assured in bits for hand brace, spiral, and power driving.

GET THIS HELPFUL BOOKLET

Phillips Screw Mfrs., c/o Horton-Noyes Co.
1800 Industrial Trust Bldg., Providence, R. I.

Send me the new booklet—"How to Select Recessed Head Screws for Practical Production Driving".

Name .....

Company .....

Address .....

.....

MP-28

PHILLIPS Recessed Head SCREWS

Wood Screws · Machine Screws · Self-tapping Screws · Stove Bolts

25 SOURCES

American Screw Co.
Central Screw Co.
Continental Screw Co.
Corbin Screw Div. of American Hdwe. Corp.
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Milford Rivet and Machine Co.
National Lock Co.
National Screw & Mfg. Co.
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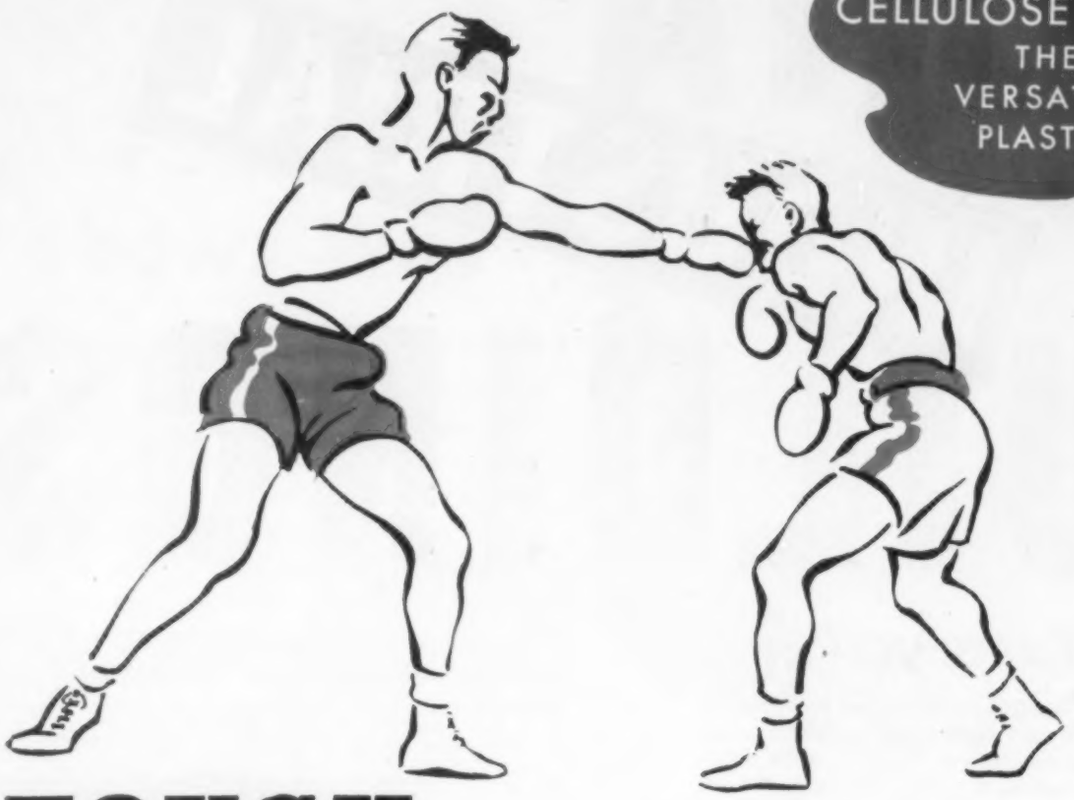
Parker-Kalon Corporation
Pawtucket Screw Co.
Pheoll Manufacturing Co.
Reading Screw Co.
Russell Burdsall & Ward Bolt & Nut Co.
Scovill Manufacturing Co.
Seaboard Screw Corp.
Shakeproof Inc.
The Southington Hardware Mfg. Co.
The Steel Company of Canada, Ltd.
Sterling Bolt Co.
Stronghold Screw Products, Inc.
Wales-Beech Corp.
Wolverine Bolt Company

Away back in 1868, cellulose nitrate was developed by treating cotton cellulose with nitric acid. This was probably the origin of the present plastics industry.

1868-1948
CELLULOSE NITRATE
THE
VERSATILE
PLASTIC



TOUGH
BUT ALSO FLEXIBLE

NIXON C/N has many good fighting qualities. You cannot knock it out easily. Compress it, hit it, rough it up any way you wish and it retains its dimensional stability. Yet under correct treatment, it can be permanently shaped, formed, and cemented. It adapts itself to the job at hand whether for a mallet head or a hosiery form. Each gets tough treatment, but of a different type. You will find NIXON C/N easy to use and economical too. It is priced moderately so that it is practical to use for any plastic job. Consider NIXON C/N and other NIXON Cellulosics . . . NIXON C/A (Cellulose Acetate) and NIXON E/C (Ethyl Cellulose) for your next application. Available in Sheets, Rods, Tubes, and Extruded Shapes and (except for NIXON C/N) in Molding Powders. Wide color range.

NIXON
C/N
CELLULOSE
NITRATE

NIXON NITRATION WORKS • NIXON • NEW JERSEY

Representatives: New York, Chicago, Detroit, St. Louis, Leominster • *Sales Agents:* NORTHWEST PLASTICS INDUSTRIES: Portland, Oregon; Seattle, Washington
Canadian Distributors: CRYSTAL GLASS AND PLASTICS, LTD., Toronto, Can. • *Export Distributors:* OMNI PRODUCTS CORP., 460 4th Ave., N. Y. 16, N. Y.

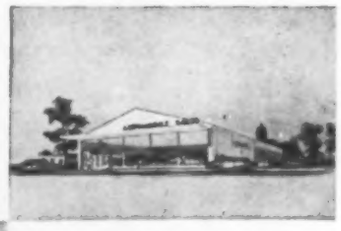
LURIA INDUSTRIAL BUILDINGS

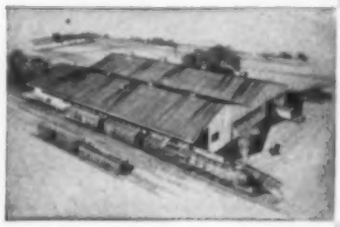
NOW IN PRODUCTION

LURIA STANDARD BUILDINGS are permanent structures designed for maximum utility and flexibility. Large door openings, ample eave height and unobstructed clearance to the rafters make these buildings adaptable for innumerable uses. The unit system of expansion both in width and length combined with a choice in location of doors and sash provide unlimited variation in size and arrangement. These features allow a selection of combinations that are calculated to meet most individual requirements, thereby eliminating the expense of special engineering and gaining the benefit of production line economy. Simplicity of design featuring prefabricated frames of structural steel, insures easy handling and economical erection.

Corrugated steel sheets provide the most economical covering and are widely used with structural frame buildings. An additional feature of the Luria Structures is that they are designed to accommodate various types of collateral materials. This is important where requirements dictate the use of particular materials and also gives the advantage of greater freedom in architectural treatment.

BASIC UNIT WIDTHS 40' TO 100' CLEAR SPAN
LENGTH ADJUSTABLE IN INCREMENTS OF 20'
CLEARANCE AT EAVES 12' TO 20'





ADAPTATIONS OF STANDARD UNITS

LURIA ENGINEERING CORPORATION

500 Fifth Avenue, New York 18, N. Y.
1734 Candler Bldg., Atlanta 3, Georgia
First National Bank Bldg., Chicago 3, Illinois

MANY THINGS ARE BETTER BECAUSE OF PLASTICS

. . . This Portfolio Shows Why!

28 ACTUAL PLASTICS APPLICATIONS ARE DESCRIBED IN DETAIL

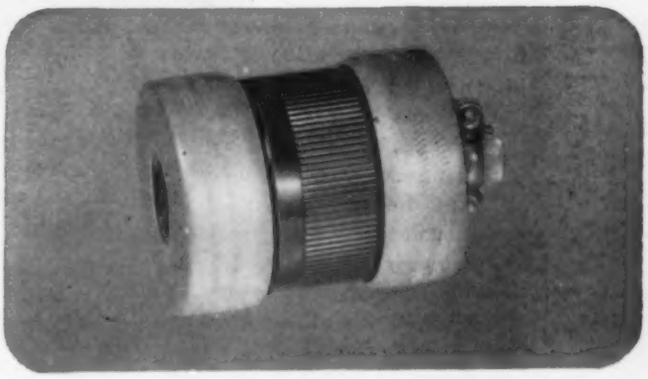
This Aico Portfolio of Plastics Applications will stimulate creative designing . . . perhaps solve that problem you've been pondering.

Aico engineers . . . backed by more than 32 years of molding experience using all molding methods and materials . . . have helped many manufacturers improve their product by the use of molded plastics. Their expert advice on mold design, molding methods and choice of material will make your product "one for the book".

Write for Your Portfolio Today

It's Packed With Facts Like These About the Use of Plastics

Aico engineered this handle with an insulating layer of air between it and the body of the iron. This permitted use of economical phenolic material. Molding in a 4-cavity semi-automatic top ram transfer mold . . . combined with preforming and electronic preheating . . . assures a fast molding cycle and thorough curing despite section thicknesses which vary from 3/32" to 1".

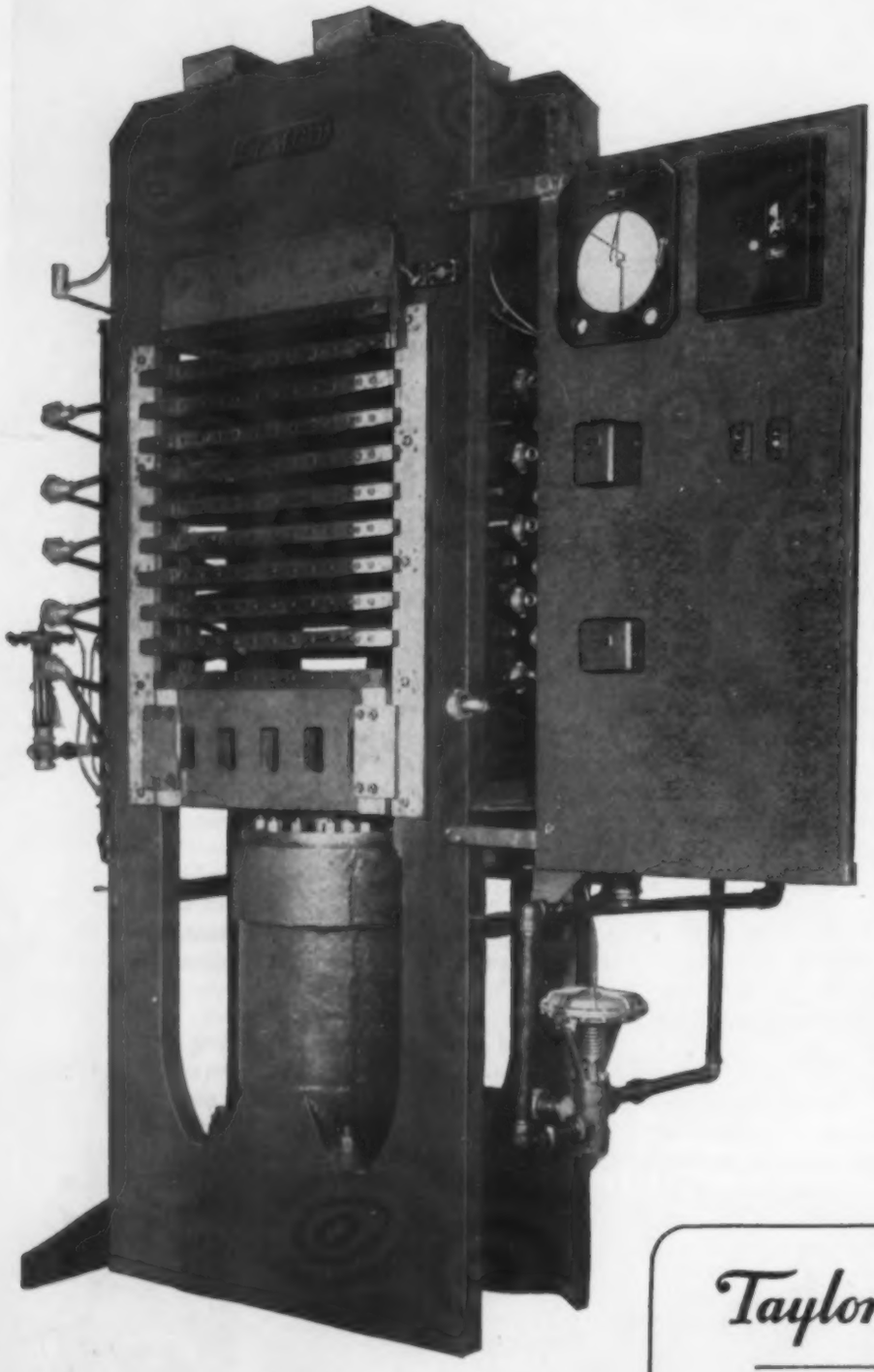


Two plastic materials are used in this heavy-duty electrical connector. Metal cap on each end contains the connecting elements molded into Amerine, an original Aico cold molding compound of great electrical and thermal insulating value. Body is black phenolic molded with internal radial walls which afford positive insulation between connector prongs.

AICO **PRECISION MOLDING**
for over 32 years

AMERICAN INSULATOR CORPORATION • NEW FREEDOM, PA.

HOW AUTOMATIC CONTROL SAVES 9 STEPS IN PLATEN PRESS MOLDING



HERE you see a new "EEMCO" heavy-duty hydraulic press, built by the Erie Engine and Mfg. Company at Erie, Pa. Those Taylor Instruments on the panel attached to it are there to save you these *nine vital operating steps!* Here's what happens:

1. Fulscope Controller (upper left) records and controls outlet press temperature by throttling steam inlet valve.

2. Repeating Cycle Timer (left center) operates condensate discharge valve periodically and automatically.

And then the **Flex-O-Timer** automatically handles these seven steps:

1. Closes press.
2. Supplies air to Fulscope which then turns steam on. Also supplies air to Repeating Cycle Timer.
3. Cooling water is off and discharge valve is in position to close water to drain and open condensate return.
4. Master Timer stops and cuts in Auxiliary Timer to time the cure.
5. At end of cure, Auxiliary Timer stops, Master Timer restarts, air is shut off to Temperature Controller and Repeating Cycle Timer, shutting off steam supply. Master Timer also repositions three-way valve in outlet to close condensate return and open water-to-drain connection. Also turns on cooling water.
6. At end of cooling, Flex-O-Timer turns off water, reverses position of three-way valve in outlet, ready for next cycle.
7. Press opens and Flex-O-Timer stops.

TOTAL: 9 steps—**the whole curing process**—controlled automatically without a single chance of human error! Another reason why we say, "When ordering processing equipment, specify Taylor equipped as usual." Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

Instruments for indicating, recording and controlling temperature, pressure, humidity, flow and liquid level.

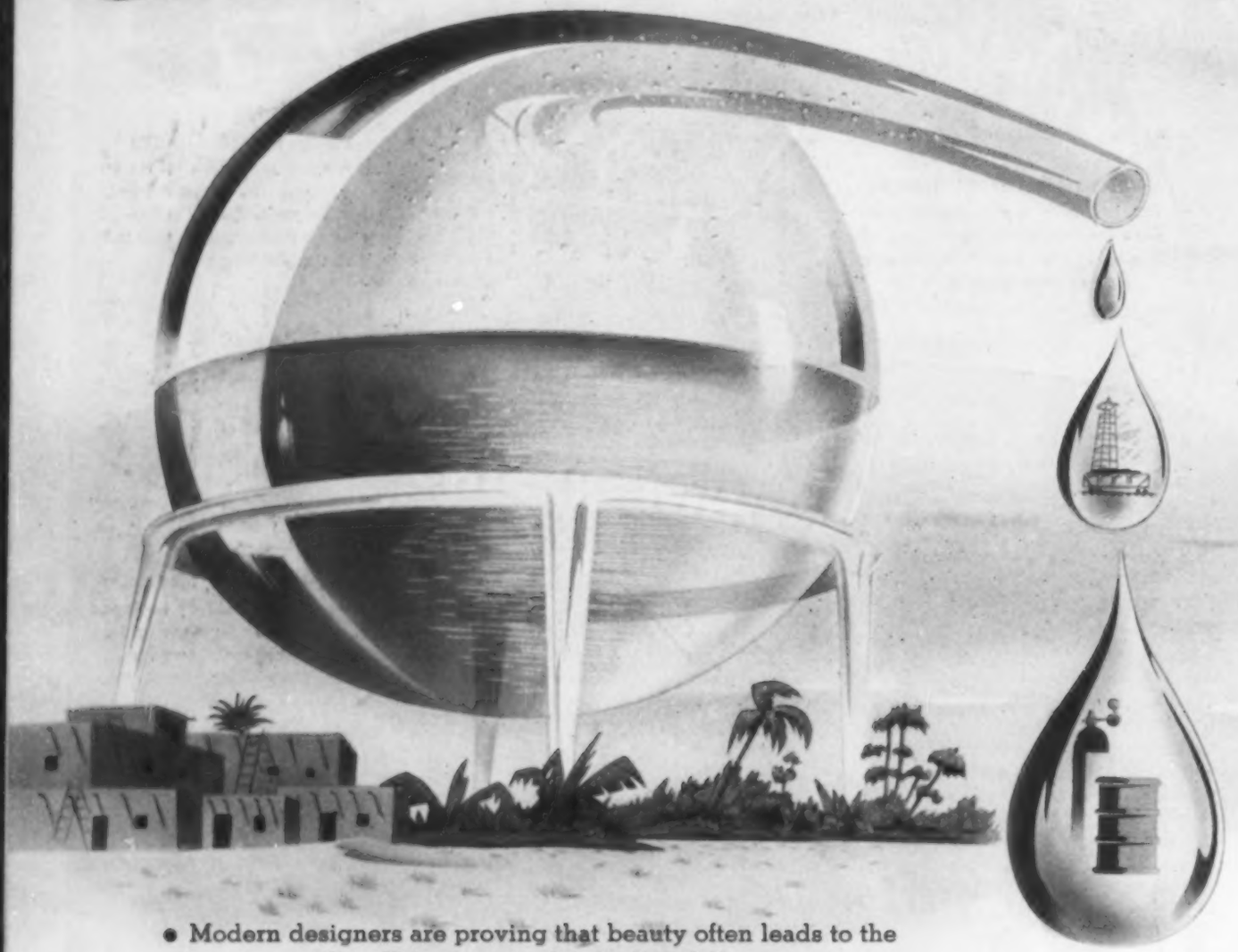
Taylor Instruments

MEAN

ACCURACY FIRST

IN HOME AND INDUSTRY

Quintessence of Utility

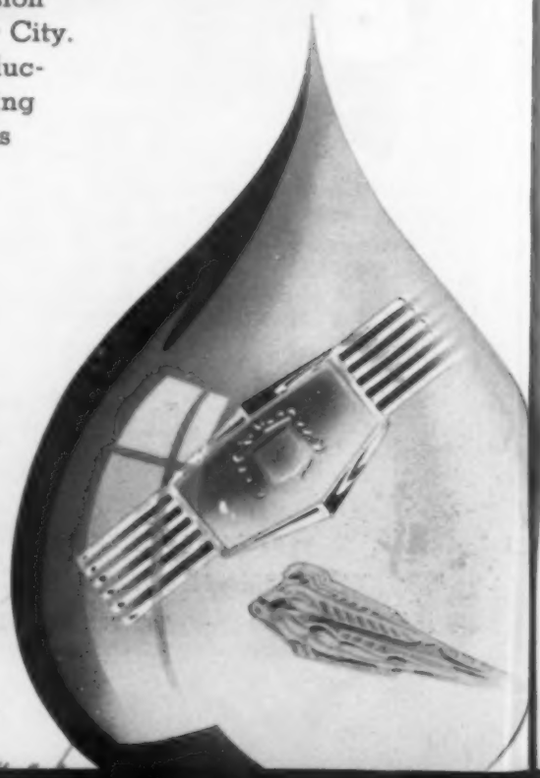


• Modern designers are proving that beauty often leads to the ultimate in utility. This new trend is finding full expression at Auto-Lite's great Bay Manufacturing Division in Bay City. Here under one roof are the technical skills and production capacity for a new art rendered in plastics including brilliantly colored elastomeric plastics, decorated metals and metal-plastic combinations. The artistic skill of Auto-Lite's Art and Style Division is available on matters of design and development.

THE ELECTRIC AUTO-LITE COMPANY

Bay Manufacturing Division

733 New Center Bldg., Detroit 2, Mich. • Bay City, Mich.



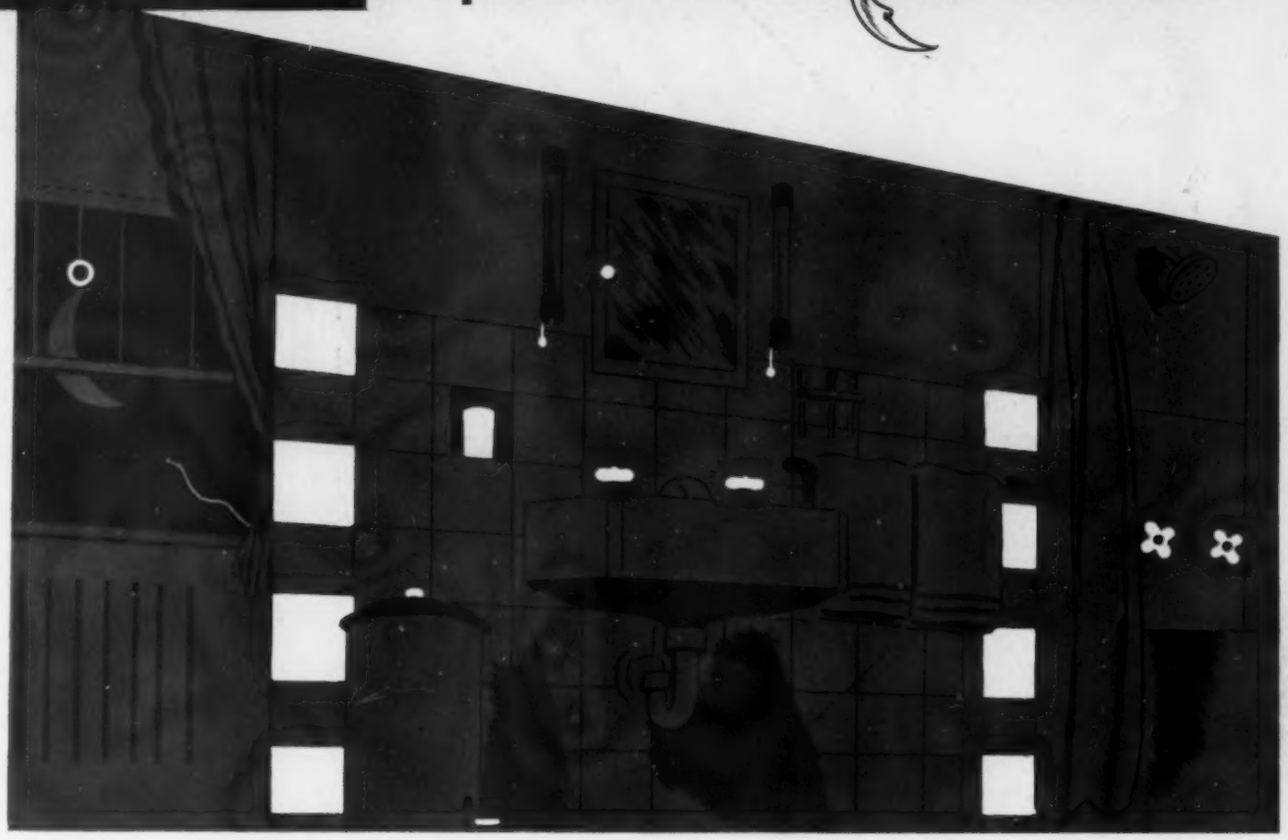
Auto-Lite

plastics and metals

AUTO-LITE MEANS PRECISION MANUFACTURING

Tune in the Dick Haymes Show for Auto-Lite, Thursday, 9:00 P.M.—E.T. on CBS.

PAULITE the plastic that's BRIGHT at NIGHT



Articles made from PAULITE — the amazing new luminescent molding compound — are ivory-white under normal conditions and emit a revealing, bright blue glow in the dark. PAULITE is activated by sunlight or artificial illumination and gives off a strong afterglow for more than 10 hours in total darkness! Hence, items molded from PAULITE, in addition to being useful, have high novelty appeal.

Unlimited applications

The uses to which PAULITE can be adapted are limited only by imagination and ingenuity. It can be utilized for molding toggle switch plates, clock faces, drawer pulls, house numbers, markers, door knobs, telephone dials, automobile, aircraft and marine accessories, wall tile, flashlight cases, flashlight lens heads — anything which must be found or seen in the dark.

Easy to use

Luminescent PAULITE comes in 1/8" to 1/4" granules — ready for immediate molding. You handle PAULITE just as you would any other molding compound — it requires no special treatment during molding.

THE PREMIERE IN LUMINESCENT PLASTICS
PAULITE
REG. U.S. PAT. OFF.

Luminescent
PLASTICS CORPORATION
201 N. WELLS STREET CHICAGO 1, ILL.

MAIL THIS COUPON FOR FULL DETAILS

LUMINESCENT PLASTICS CORP.
201 N. Wells Street
Chicago 1, Ill.

Gentlemen:

We're interested in PAULITE, the plastic that really glows in the dark, for molding the following items.....

.....

Please send us detailed information on PAULITE'S physical properties and colors. Include data on prices and delivery dates.

Name.....

Firm.....

Address.....

INJECTION MOLDING RADIO CABINETS IS BECOMING A GOOD "HABIT" AT *SANTAY*

Santay

SYMBOL OF PRECISION CRAFTSMANSHIP

ANOTHER "habit" of which we are justifiably proud is our ability to keep old customers completely satisfied and to acquire new customers through our reputation for ability and *dependability!*

Adding Warwick Manufacturing Company of Chicago to our long list of satisfied customers marks the successful inauguration of another mutually pleasant new customer-supplier relationship. The simple functional design of Warwick's new cabinet housing, molded of high heat-resistant polystyrene, is the result of design and production suggestions by *Santay* engineers which cut costs to a minimum.

Perhaps you too have a development or production problem which our years of tooling and molding experience can help you solve. Come in and talk it over with our engineers — or write or phone for complete information.

INJECTION MOLDING AND METAL STAMPING • ELECTRO-MECHANICAL ASSEMBLIES

SANTAY CORPORATION, 355 NORTH CRAWFORD AVE., CHICAGO 24, ILLINOIS

REPRESENTATIVES: BURTON SALES CO., BRISBANE BLDG., BUFFALO 3, N.Y. • QUEISSER BROS., 110 E. 9th ST., INDIANAPOLIS 2, IND. • PAUL W. SEILER, 7779 CORTLAND AVENUE, DETROIT 4, MICHIGAN • C. E. WHITE & CO., BULKLEY BLDG., CLEVELAND 15, OHIO • WILLIAM S. RICHARDS COMPANY, 4903 DELMAR BOULEVARD, ST. LOUIS 8, MISSOURI.

NOW YOU CAN GET FOR OUTSTANDING

The Modern Plastics Competition

ENTER AS MANY PRODUCTS AS YOU WISH

The SEVENTH MODERN PLASTICS COMPETITION which is being held for the first time since 1941, originated in the year 1936 for the purpose of stimulating progress in plastics and for improving the appreciation of sound plastics applications. This Competition has grown to a point where it is now recognized as one of the outstanding public relations efforts by the plastics industry.

WHO CAN ENTER THE COMPETITION

Entries are welcome from all concerns or individuals who have had any part in creating or producing any plastic component or product or application now in production and first marketed since August 31, 1945. There is no entry fee but all entries submitted must be in good working order. Items too large for ordinary shipment, such as boats, vending machines, etc., should be entered with photographs and engineering drawings. There is no limit to the number of products that can be entered in the Competition. There are no fees or obligations of any kind.

WHAT YOU GAIN

By entering your products in the Modern Plastics Competition you get an endless source of free publicity, added prestige, and wider recognition for your firm. A winning entry means that your products will be on display in the traveling exhibit which will tour the country. Arrangements are being completed for exhibits in England, France, Argentina and Australia. All entries that are used in the traveling exhibit will be identified and complete credit will accompany each winning entry. Thus, through the national and world-wide exhibits international prestige is assured.

CLOSING DATES

All entries must be in our office on or before May 15, 1948 regardless of the postmarked date. Entries will be judged about June 1st and winners will be announced in the September 1948 issue of Modern Plastics magazine.

MODERN PLASTICS
A BRESKIN PUBLICATION
122 EAST 42nd STREET • NEW YORK 17, N. Y.

NATIONAL RECOGNITION PLASTICS APPLICATIONS

to be held for the first time since 1941

WHO WILL JUDGE THE COMPETITION

Six distinguished judges will choose the winning entries in the 1948 Modern Plastics Competition. These judges will evaluate your product from many angles including design, correct application for material, manufacturing method, merchandising and informative labeling.

ALFRED AUERBACH — Founding editor of *Retailing Home Furnishings* and for 14 years its chief, our senior judge served during the war as Director of the Consumer Durable Goods Div. of OPA. He now heads Alfred Auerbach Associates, sales engineers in home furnishings and allied industries, offering market research, merchandising and styling counsel.

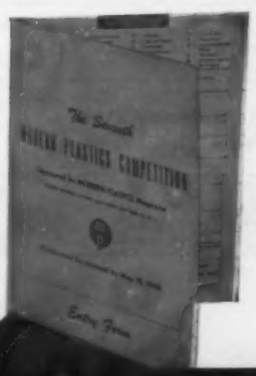
DON G. MITCHELL—The youthful president of Sylvania Electric Products Inc., is referred to as the man who put electric light bulbs in egg cartons, beer in cans and milk in paper bottles. His brilliant career has been a series of top executive posts with such firms as Niagara-Hudson Power Co., American Can Co., Marshall Field & Co., and Pepsi-Cola Co.

J. GORDON LIPPINCOTT—A senior member of Lippincott and Margulies, Inc., industrial designers, J. Gordon Lippincott has been responsible for some important design trends in plastic products and for the successful styling of many manufactured items. His new book *Design for Business* has aroused nation-wide interest among manufacturers and merchandisers.

EPHRAIM FREEDMAN — Director of Macy's Bureau of Standards for 20 years, Ephraim Freedman has helped to establish pre-market product testing and to strengthen plastics merchandising. He is president of the American Association of Textile Technologists, a Fellow of the American Institute of Chemists and is either a director or member of seven other professional bodies.

LAWRENCE COWEN — An engineer with a flair for industrial management, Lawrence Cowen, president of Lionel Corp., has taken the model railroad firm founded by his father to a 1947 retail sales record of over $23,000,000. Five million boys and men run Lionel trains over 12,000 miles of miniature track.

JEAN O. REINECKE — A member of the well-known Chicago industrial design firm of Barnes and Reinecke Inc., Jean Reinecke has long been identified with plastics engineering and design. In past years his company won a total of 11 awards in Modern Plastics Competitions. He is respected by technical men throughout the United States.



SEND FOR YOUR ENTRY BLANKS

Entry blanks are available free. All you have to do is to write to Modern Plastics magazine at the address shown. You can have as many entry blanks as you wish and you can enter as many products as you care to. Complete instructions, classifications accepted, and all necessary information that you must have for entering your products is included in the entry blank.

MAIL COUPON FOR YOUR ENTRY BLANKS!

MODERN PLASTICS MAGAZINE
122 East 42nd Street
New York 17, N. Y.

Gentlemen:

Please rush.....entry blanks for your MODERN PLASTICS COMPETITION.

Company Name.....

Address.....

Date.....

Signature

THE "Glowing" KEY to the LAND OF NOD

"Luminous" Plastic Wall Plaques that Shine at LULLABY TIME help to provide the child with a sense of security in his darkened bedroom by their friendly luminous glow. Wall plaques molded of phosphorescent polystyrene (American Phenolic Corp.) for Agate Plastics Corp.

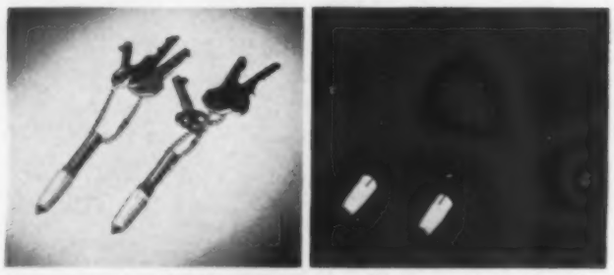
Give Old Products NEW Ideas By Making Them—in Whole or Part—"Luminous"

THE manufacturers of the "luminous" products illustrated had but *one* objective: to make their products easier to sell at a profit by giving the buyer the *plus* value of "glowing in the dark." These are but a few of the hundred-and-one† applications for phosphorescent (luminous) plastics. Others include jewelry, flashlights, clock cases and dials, lamps and lampshades, switches, switch plates and shields, table tops, bell push buttons, door push plates, safety signs and markers, toys, gifts and novelties.

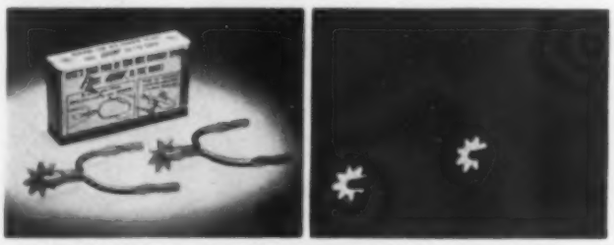
We shall be glad to work with you on any product you feel will be better if made of phosphorescent plastics. Names of suppliers of "luminous" plastic compounds on request.

†Your copy of booklet "101 Useful Lumihescent Applications" will be mailed on request.

*Reg. U. S. Pat. Off.



Luminous-tipped "Round-the-World" Reynolds ball point pen and key chain. The protective tip is molded for Reynolds Pen Co. by Perry Plastics Co., using phosphorescent Lustron (Monsanto).



"Tom Mix" Spurs that Glow in the dark for young Ralston-Purina customers. The rowels were molded of phosphorescent polystyrene by Injection Molding Co. for Jackes-Evans Co., who made the completed spurs for Ralston-Purina Co.

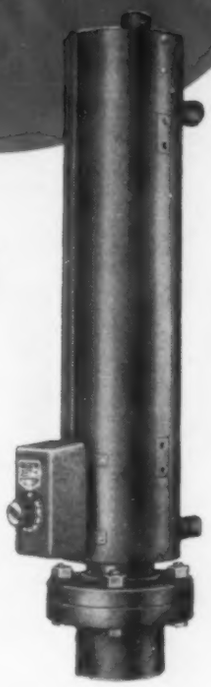
HORSE HEAD PRODUCTS
New Jersey Zinc

THE NEW JERSEY ZINC CO. • 160 Front Street, New York 7, N. Y.

It's Horse Head* Luminescent Pigments that MAKE these Plastics "Glow"

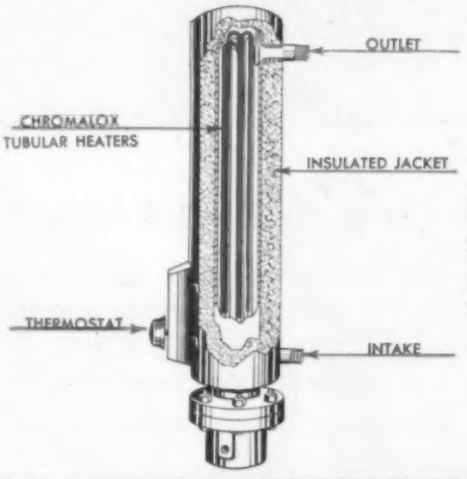
LOW-COST ELECTRIC HEAT at elevated temperatures

Chromalox Steam and Air Pre-Heaters



CHROMALOX Electric Pre-Heaters are used for super-heating steam and pre-heating air and other gases needed for processing, drying, vacuum packing, conditioning plastics powders, and other applications requiring dry heat. Temperatures up to 750° F. are rapidly reached and accurately maintained by thermostatic controls.

Dependable performance, economical operation, minimum attention are among the many advantages gained by using these and other easy-to-install CHROMALOX Heaters in your plant or product.



Steam, air or other gases are heated by steel or alloy sheathed CHROMALOX Tubular Heaters designed for heavy duty service. Thermostat is easily preset to required operating temperatures.

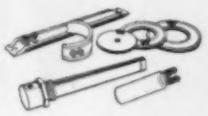
CHROMALOX

Electric Heat for Modern Industry

SC-36

CHROMALOX offers you the most in Electric Heat

Selection . . .



10,000 different types, sizes and ratings of electric heaters. Immediate delivery on standard types.

Engineering . . .

Experienced research and development personnel with the technical know-how for solving industrial heating problems.

Experience . . .

Specialized production facilities—plus 31 years of manufacturing skill in electric heating equipment.

Service . . .

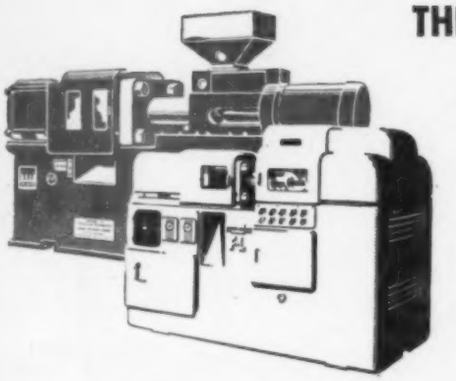
Over 100 Chromalox Application Engineers in 35 key cities for "on-the-job" assistance and recommendations, at no cost.

Want the Facts?

Send for Catalog No. 42 on Chromalox Electric Heaters; the useful booklet of application ideas "100 Ways to Apply Electric Heat," and the address of Chromalox Application Engineer serving you.

EDWIN L. WIEGAND CO.
7503 THOMAS BOULEVARD
PITTSBURGH 8, PENNSYLVANIA

CENTERED FOR LONGER MOLD LIFE



THE ALIGNMENT EASE afforded by the F-L rugged centralized adjustment screw has the added advantage of greatly safeguarding the molds. Take-up is always evenly applied. "Cramping" and "pounding" of the molds are minimized; mold distortion is prevented. Positive alignment further reduces the danger of flash. Obviously, set-up is infinitely easier. It's only one of the many Fellows-Leominster design advantages that make for more profitable molding. Investigate by contacting the office nearest you.

The rugged centralized adjustment screw applies even pressure without tilting, through a continuous-pressure-line-toggle for positive mold alignment.

Fellows

LEOMINSTER

injection molding equipment

THE FELLOWS GEAR SHAPER CO., Plastics Machine Division. Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2; 640 West Town Office Bldg., Chicago 12; 7706 Empire State Bldg., New York 1. New England Distributor, Leominster Tool Co., Leominster, Mass.

NEW HORIZONS . . .

With their long-range "telescopes" of chemistry and research, industry is forever probing into distance and the future—scanning new horizons for objectives hitherto considered impossible to attain.

Perhaps these lenses of science are seeking a newer and better plastic—a tougher kind of metal or more potent insecticide—a more exotic perfume or an "antidote" against germ warfare . . .

Heyden chemicals have always played a major role in these unpredictable developments. They will continue to anticipate the demands for finer chemicals by the process industries and their tireless research laboratories.

OF IMPORTANCE TO MANUFACTURERS OF PLASTICS AND RESINS

Heyden

- Formaldehyde
- Paraformaldehyde
- Hexamethylenetetramine
- PENTEK® (For mar-resistant coatings)
- LIGNOCOL® (Anti-skinning agent)

Technical Literature, shipping details and prices mailed on request

HEYDEN CHEMICAL CORPORATION

393 SEVENTH AVENUE, NEW YORK 1, N. Y.
CHICAGO OFFICE, 20 North Wacker Drive
PHILADELPHIA OFFICE, 1700 Walnut Street

FINE HEYDEN CHEMICALS

Benzaldehyde • Benzoates • Benzoic Acid • Benzyl Chloride • Bromides • Chlorinated Aromatics • Medicinal Creosotes • Formates Formaldehyde • Formic Acid • Glycerophosphates • Medicinal Guaiacols • Hexamethylenetetramine M.D.A. • Paraformaldehyde Parahydroxybenzoates • Penicillin • Pentaerythritols • Salicylates

"A Name to Remember in Plastics"

COMPLETE INJECTION MOLDING FACILITIES
FOR CUSTOM MOLDING

- NEW MOST MODERN INJECTION MACHINES
- EXPERIENCE IN WORKING ALL THERMOPLASTIC MATERIALS
- COMPLETE FACILITIES—ENGINEERING, DESIGNING, MOLD BUILDING
- ONE SOURCE—ONE SUPPLIER
- QUALITY PRODUCTION GUARANTEED
- IN ANY QUANTITIES

QUINN-BERRY CORPORATION

2601 WEST TWELFTH STREET
ERIE, PENNSYLVANIA
TEL. ERIE 3-2641

SERVEL ASKED GENERAL AMERICAN

"CAN YOU MOLD PLASTIC BREAKER STRIPS UP TO 31 INCHES LONG?"

GENERAL AMERICAN DELIVERED!

Servel wanted a new type of refrigerator breaker strips produced for their 1947 models. These parts had to be redesigned with graceful compound curves in order to add new beauty and greater sanitation.

After tests, production was set up on high-speed 22-oz. injection presses. The die-sets were adapted to accommodate a two-cavity mold for strips up to 31 inches long. With this successful new use for injection molding, absolute uniformity and perfect color matching were maintained to meet Servel's strict specifications. General American delivered six separate breaker strips in large quantities to meet schedule requirements.

Another big plastics job—done *first* at General American! . . .

HOW GENERAL AMERICAN CAN HELP YOU PLAN PLASTICS

This Servel job is typical of the many "tough ones" planned, produced and delivered by General American.

Specialized product stylists—the leading designers in every field—will design or restyle your product.

General American engineers—experts in plastics, will suggest the proper plastic, design and build the correct dies for the job.

Your part or product will be molded and finished on the most modern equipment available—injection presses up to 32-oz. capacity and high-speed compression presses up to 2000-tons (71" x 74" platen areas).

PLASTICS DIVISION

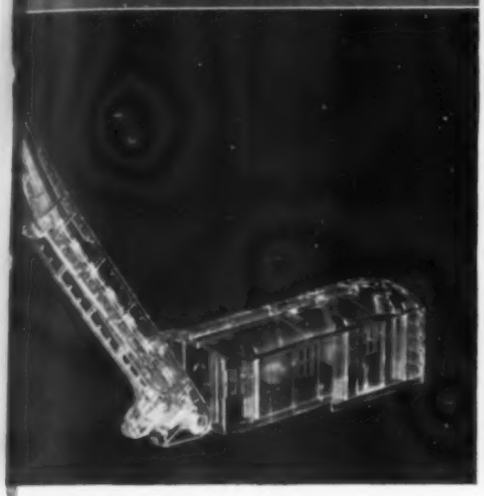
GENERAL AMERICAN TRANSPORTATION CORPORATION

135 South LaSalle Street, Chicago 90, Illinois

PLASTICS DIVISION GENERAL AMERICAN Trade Mark

New York
10 East 49th Street

Los Angeles
Richfield Building



Originality Unlimited!

—that's the thrill of working with plastics!

TOYS that make Grown Men Envious!

❶ A water-tower that *works*—a magnetic crane that picks up and deposits loads—in miniature! These fascinating new LIONEL replicas will delight designers and production men who take the time to examine how they were made. Both were molded from BAKELITE Styrene Plastic—quickly, simply and cheaply—for the *maximum* in realism and sturdy strength. Another example of excellent design in a versatile medium!

BAKELITE NEWS

NO. 1

NOTES ON BETTER, FASTER, LOWER COST PRODUCTION WITH PLASTICS

NICE WORK . . . and you can get it!

❷ It's always nice to work in such delightful surroundings as these modern offices . . . with furniture and wall paneling made of laminated plastic sheet impregnated with BAKELITE phenolic resins. Not half as expensive as they look! And they clean easily and possess excellent wear resistance. Scores of surface effects available including authentic wood veneers.

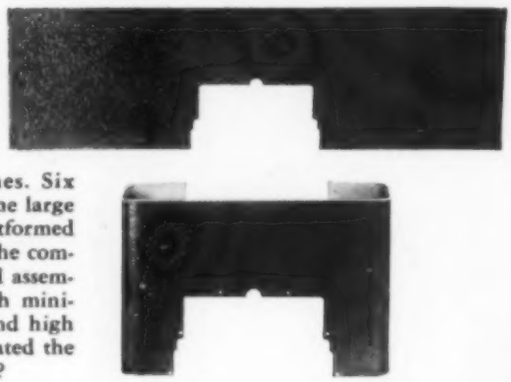
The TOASTMASTER TOASTER tells a story

❸ Yes—a story in three parts. Plastic parts! It's a story that goes back many years but is always new and fresh. A story of economy in manufacture, of superior performance in heat resistance, mechanical strength, impact strength, dielectric properties and beauty of finish. It's the story of BAKELITE phenolic plastics for functional parts—a story that reaches its climax at the point of sale!

A One Piece Cabinet

that steps up styling . . . and production, too!

❹ At a glance, the new Arvin portable radio has *quality* appeal! Handsomely styled—and sturdily constructed. And much of its appeal lies in the cabinet—postformed from laminated paper stock impregnated with BAKELITE phenolic resin varnishes. Six blanks at a time are stamped from one large panel. Each is then re-heated and postformed in one simple operation to produce the complete cabinet shell . . . ready for final assembly. Result—speedy production with minimum finishing, low tooling costs, and high performance! . . . Have *you* investigated the possibilities of postformed laminates?



TRADE-MARKS

BAKELITE

BAKELITE CORPORATION
Unit of Union Carbide and Carbon Corporation
UCC
30 East 42nd Street, New York 17, N. Y.

EVERY DESIGNER SHOULD KNOW ABOUT THE EXPANDING FAMILY OF PLASTICS

Check coupon below for information on specific subjects illustrated or write for copy of booklet G-8 "A Simplified Guide to Bakelite and Vinylite Plastics."

There's MAGIC in this Formula!

❺ Now you can get metal coatings that are extremely *hard*—yet flexible enough to be mar-proof, long-lasting, maintaining both appearance and protective quality under abusive service! Ideal for coating in the flat sheet *before* the manufacturing cycle begins. These unique coatings are based on BAKELITE resin XJ-17997.

Extra Speed for Fast-Selling Items!

❻ Many a fast-stepping product can be given an extra burst of sales-speed with a package molded from BAKELITE Styrene Plastic! Versatile, light in weight, strong, available in all colors of the rainbow, this material presents a challenge to creative package designers!

BAKELITE CORPORATION, Department 4
30 East 42nd Street
New York 17, N.Y.

Please send information on subjects checked below:

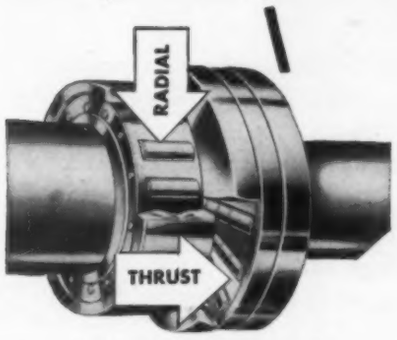
- ☐ 1. Molded Styrene Plastics
- ☐ 2. Laminated Sheet materials
- ☐ 3. Phenolic Molded parts
- ☐ 4. Postformed laminates
- ☐ 5. Metal coatings based on XJ-17997
- ☐ 6. Styrene plastic packages

Your Name_____ Title_____

Your Company_____

Address_____ City_____ Zone___ State_____

Handles Heavier THRUST LOADS Reduces Shut-Downs



For Combined Radial and Thrust Loads

Right Angle Loading splits every load into components of pure radial and pure thrust. Thus, where combined loads are involved, a Rollway Radial Bearing takes the radial load . . . a Rollway Thrust Bearing takes the thrust load.

FREE SERVICE—Send us your designs for bearing analysis and recommendations.

Rollway Right Angle Loaded Bearings eliminate oblique loads on the rollers . . . prevent compound loads from piling up . . . provide greater resistance to shock.

Hence, Rollway Thrust Bearings, designed for *thrust only*, carry heavier loads with less roller end-rub . . . with less roller wear-back . . . without roller pinch-out. Result: lower maintenance, fewer shut-downs, and less replacements.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, N. Y.

ROLLWAY
RIGHT-ANGLE LOADED
BEARINGS

OFFICES IN: PHILADELPHIA • BOSTON • PITTSBURGH • CLEVELAND • DETROIT
CHICAGO • MINNEAPOLIS • BIRMINGHAM • HOUSTON • LOS ANGELES

Here's What's

IN STOCK FOR YOU

.. IN 48 ..

Molded Plastic

KNOBS, HANDLES, CLOSURES BY GRIGOLEIT

When your plans for 1948 call for versatile, smartly-styled, precision-molded plastic products—call on Grigoleit.

A complete line of attractive stock handles, knobs, pulls, pendants and closures is now available for immediate shipment. Save designers' fees . . . eliminate mold costs and slow-downs. You'll be way ahead in time and money when you choose from Grigoleit's wide selection of stock molded plastic parts.

Consult Grigoleit now for stock or custom-molded plastic items. Write for colorful, fully-illustrated 28-page catalog.

In '48—depend on Grigoleit.

THE GRIGOLEIT COMPANY

"Twenty Years in Plastics"

744 E. NORTH ST. DECATUR, ILLINOIS

It's Smooth...

THIS SURE BUT GENTLE FLUID FORCE ...AND EVERYTHING LASTS LONGER!

● There are *many things* about hydraulic pressure that no other force can match, yet *smoothness* is the most important of them all. Hydraulic pressure is a *gradual application*—not impact and momentum. Hydraulic presses pack a wallop—but it's *gentle!*

SAVE MONEY ON OLD JOBS, AND NEW

Elmes hydraulic presses are fast—perhaps *much faster* than you think—and adjustable, of course, for stroke, pressing force, and travel. *They're economical,* too. Less product spoilage and longer life of molds and dies make already low-cost press operation *even lower* by comparison.

EXPERIENCE YOU CAN USE

These versatile, quickly variable hydraulic presses may be individually powered or group-operated. Either way, *"Engineered by Elmes"* means ample, dependable fluid force; simple, convenient control.

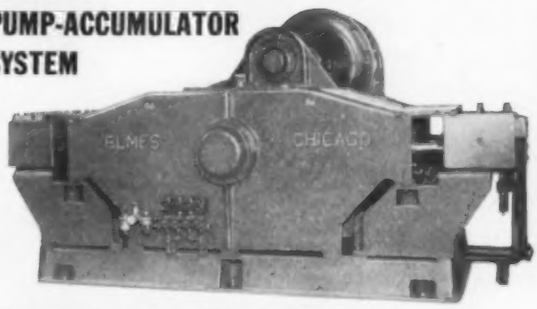
SEE FOR YOURSELF

Elmes hydraulic equipment is famous for better work, longer runs, *lower costs.* We'll be glad to give you the whole story in terms of types, sizes, specifications, and prices as related to your own particular job. No obligation.

ENGINEERED BY ELMES

Good Hydraulic Production Equipment Since 1851

ELMES PUMP-ACCUMULATOR SYSTEM



for group-operation of hydraulic presses

Elmes Horizontal Six-Plunger Pump, made in 150- to 500-h.p. sizes, and in pressures up to 35,000 p.s.i. Many exclusive features. Overlapping impulses deliver smooth flow. Also vertical pumps to 100-h.p. Ask for Bulletin 1020.

FOR ANY NUMBER OF PRESSES

A single Elmes Pump-Accumulator System will operate any number of presses at top capacity three shifts a day!

Elmes accumulators are ballasted by compressed air—have no dead weight which must be brought to an abrupt stop when flow is shut off—no internal moving parts whatever; no ram; no packings . . . no leakage.

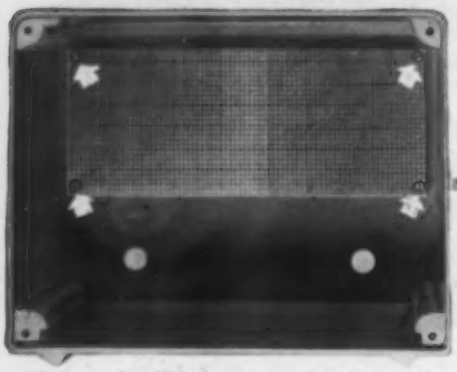
Pistonless design eliminates line shocks for longer life of presses, piping, valves, molds, dies. Patented controls maintain high and low liquid level limits—prevent excessive withdrawal. Ask for Bulletin 5100.

ELMES ENGINEERING WORKS *of* AMERICAN STEEL FOUNDRIES • 225 N. Morgan St., Chicago 7, Ill.

(*Also Manufactured in Canada*)

METAL-WORKING PRESSES · PLASTIC-MOLDING PRESSES · EXTRUSION PRESSES · PUMPS · ACCUMULATORS · VALVES · ACCESSORIES

COMMON SENSE ASSEMBLY ENGINEERING



The metal grill is fastened to the plastic cabinet with four P-K Type "F" Self-tapping Screws. The cabinet is molded of urea formaldehyde, and the chassis of an impact material. The P-K Type "F" Self-tapping Screws cut strong threads as they are driven,—can be removed and reinserted.

Four P-K Type "F" Self-tapping Screws fasten the back panel to the cabinet.

Saves 50% to 70%

over all comparative fastening methods

The light and tube sockets are fastened to the chassis with 3 P-K Type "F" Self-tapping Screws.

● Fastening of the grill, light and tube sockets, and back panel in this portable REFRESH AIRE Ozonizer for homes and offices could have been a slow, wasteful, expensive operation.

But the manufacturer, REFRESH AIRE Corp. of New York City, wisely questioned fastenings and, after exhaustive tests, chose P-K Self-tapping Screws. "The P-K 'short-cut' method proved superior to all other methods tried", reports the manufacturer, "saving from 50% to 70%."

Molding of the plastic cabinet and chassis (by the Boonton Molding Co., Boonton, N. J.) was simplified, since inserts were avoided. Tapping was eliminated, because P-K Screws form threads as they are driven in molded or drilled holes.

It's plain common sense for you to take advantage of this "short cut" to lower assembly costs wherever possible. In 7 out of 10 assemblies submitted to us, plastic or metal, the use of P-K Self-tapping Screws resulted in substantial savings—often 50% or more.

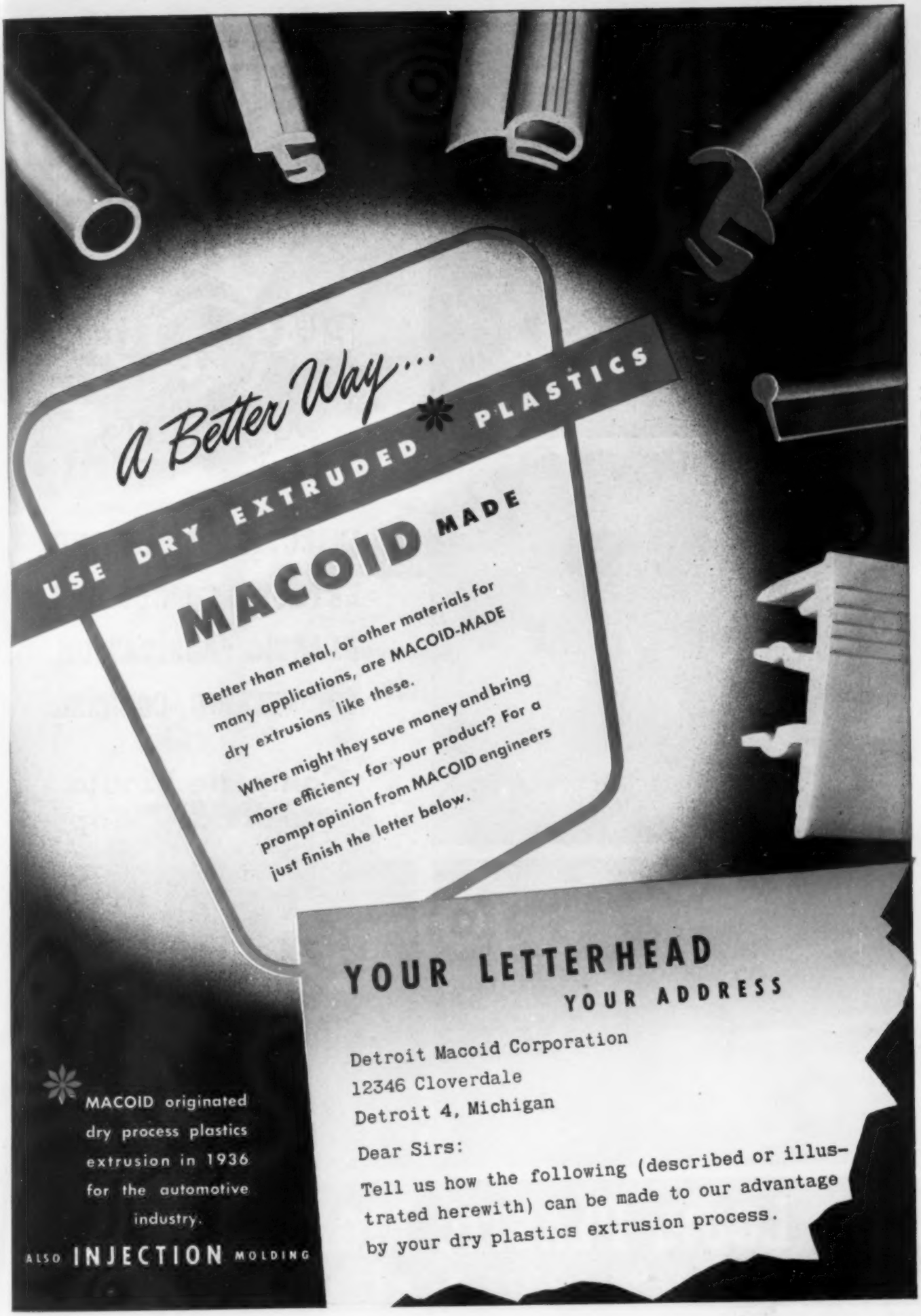
Let a P-K Assembly Engineer check your fastening operations, or mail assembly details for recommendations. Parker-Kalon Corporation, 200 Varick Street, New York 14.

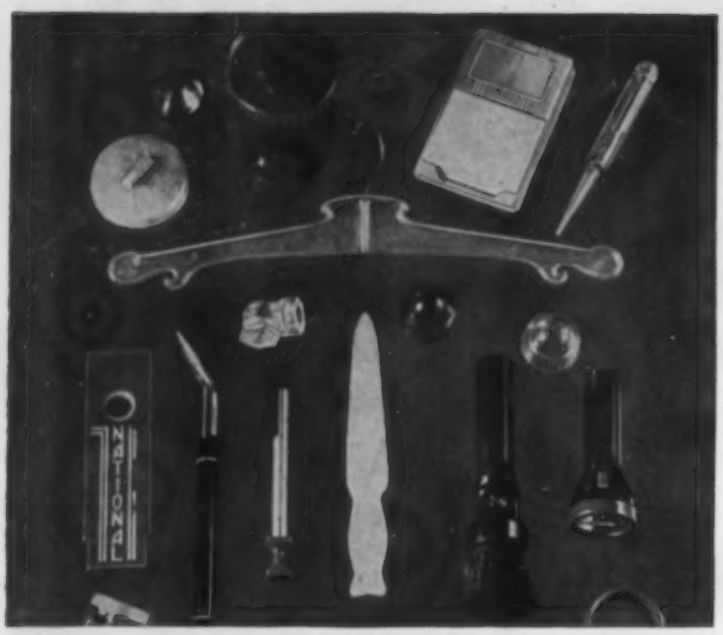
Sold Only Through Accredited Distributors

P-K

PARKER-KALON **SELF-TAPPING SCREWS**

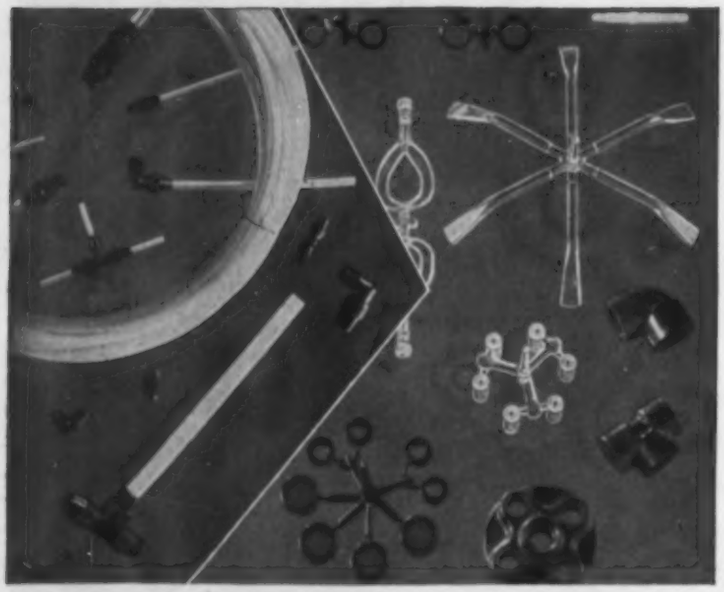
A FASTENING FOR EVERY METAL AND PLASTIC ASSEMBLY


a Better Way...
USE DRY EXTRUDED PLASTICS
MACOID MADE
Better than metal, or other materials for many applications, are MACOID-MADE dry extrusions like these.
Where might they save money and bring more efficiency for your product? For a prompt opinion from MACOID engineers just finish the letter below.
YOUR LETTERHEAD
YOUR ADDRESS
Detroit Macoid Corporation
12346 Cloverdale
Detroit 4, Michigan
Dear Sirs:
Tell us how the following (described or illustrated herewith) can be made to our advantage by your dry plastics extrusion process.
MACOID originated dry process plastics extrusion in 1936 for the automotive industry.
ALSO INJECTION MOLDING



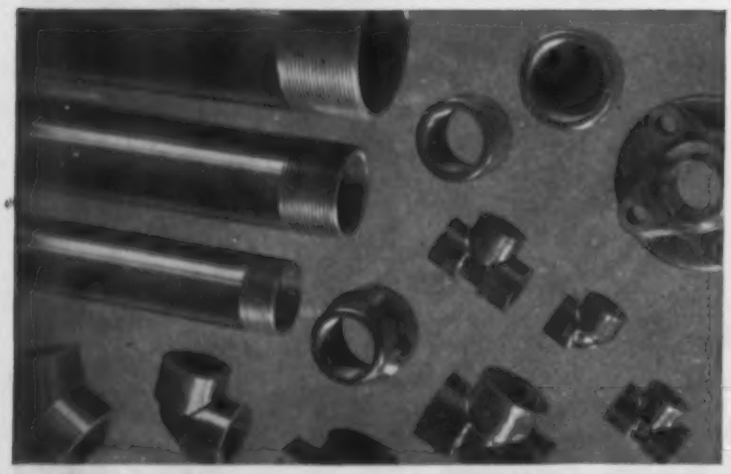
Plastic Parts
OF EVERY DESCRIPTION

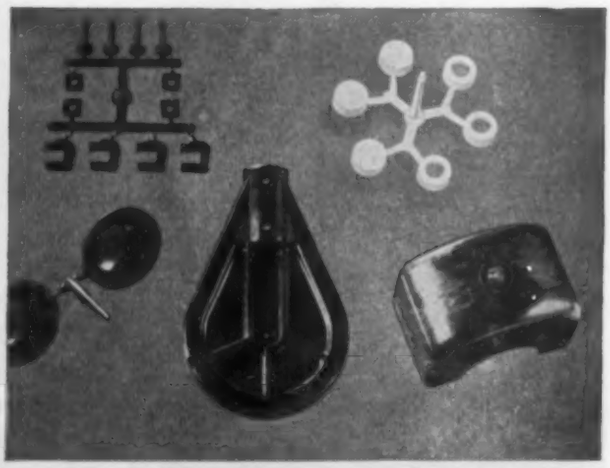
PLASTICS St. LOUIS



INJECTION MOULDING
EXTRUSION MOULDING
PLASTIC FABRICATION
ENGINEERING COUNSEL

Complete Mould and Tool Shop





ST. LOUIS PLASTIC MOULDING CO.
SAINT LOUIS 8, MISSOURI

PLASTICS PREHEATERS

pay off 3 ways

1 **BETTER PRODUCTS** Dielectric heating minimizes surface-crust formation—giving more uniform preforms, reducing scrap losses. Finishing operations are easy and quick because of thinner flash on mold parting line.

2 **SUPERIOR DESIGN** Job-tested G-E preheaters incorporate all the requirements for heavy-duty, high-production industrial use: sturdy construction, complete accessibility for maintenance, portability, and space-saving designs with more heat per cubic foot.

3 **HIGH PERFORMANCE** Production increases up to 75 per cent result from warm-up time saved in mold . . . less expensive compounds are made easy to mold . . . curing time is accelerated through uniform chemical reaction initiated before molding.

INVESTIGATE how your molding operations can profit by the three big dividends of G-E preheaters by contacting the Heating Specialist in the nearest G-E Office. In the meantime, send for free bulletin, GEA-4623A. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

Electronic Heaters

GENERAL ELECTRIC

675-188

YARDLEY CONTINUOUSLY MOLDED TUBING

A Few Typical Applications

TOYS
SANITARY, COLORFUL, NON-CORROSIVE

PENS and PENCILS
GREATER ACCURACY, FASTER FABRICATION

GARDEN HOSE
NON-CRACKING, LONGER LIFE

PACKAGING
GREATER SALES APPEAL, LASTING PROTECTION

TRUSIZE

THERMOMETERS
TRANSPARENT, UNBREAKABLE

VACUUM CLEANERS
LIGHTER WEIGHT, LOWER COST, PERMANENT FINISH

Sizes up to 2" O.D. Tolerances plus or minus .003". Produced from Acetate, Butyrate, Ethyl Cellulose and Polystyrene. Many sizes carried in stock.

YARDLEY *Plastics Co.*

142 Parsons Ave. ADams 9315 Columbus 15, Ohio

ANNOUNCING A
CAPACITY RATINGS

**Makes possible the use of smaller bearings—
with savings in bearing cost, material cost and weight
—and more compact product design**

IN the ten years since the present load capacity ratings of Timken tapered roller bearings were established, Timken bearings have been steadily improved. Improved so much that today the load carrying capacity of Timken bearings is a good *25% greater* than it was 10 years ago!

As a result, The Timken Roller Bearing Company is now able to announce a 25% increase in the load capacity ratings of all Timken bearings —following a careful review of laboratory studies on fatigue life machines over the past ten years, together with close observation of bearing performance in the field.

Permits Use of Smaller Bearings

Now you can safely carry your present bearing loads on smaller size Timken bearings. Reductions in size of shafts and housings are possible. Products can be made more compact—lighter in weight. You have an opportunity to save both on bearing costs and material costs. And this increase in ratings should enable engineers to utilize the advantages of Timken bearings in an even broader variety of applications than has been practicable in the past.

Result of Constant Quality Improvement

This 25% increase in Timken bearing capacity ratings is based on continued improvement in the quality of Timken tapered roller bearings over the past 10 years. It is due to a number of factors, including improved alloy steels made in our own Timken steel mill specifically for anti-friction bearings, better metallurgical control in the processing of this steel, more accurate manufacturing equipment, greatly improved surface finishes, and more accurate inspection methods. That these improvements in Timken bearing quality have resulted in 25% greater load capacity has been conclusively demonstrated by years of exhaustive laboratory and field studies!

New Engineering Journal to Give Facts

A new Timken Engineering Journal is now in

25% INCREASE IN OF TIMKEN® BEARINGS

The result of years of constant improvement in Timken bearing quality—supported by exhaustive laboratory studies and extensive field experience

preparation which will give complete capacity rating tabulations and will also include new bearings introduced since the last publication. Pending publication of the new Journal you may take full advantage of the 25% capacity increase by multiplying the existing ratings by 1.25.

For further assistance in the application of Timken bearings, call upon our field engineers or our Engineering Department.

Timken tapered roller bearings take any combination of radial and thrust loads, hold shafts in rigid alignment, assure precision and minimize friction. The 25% increase in load capacity ratings is the *latest* example of Timken leadership in serving the bearing needs of all industry . . . one more reason why it pays to look for the trade-mark "Timken" on every bearing you use. The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS

NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ◎ AND THRUST —◎— LOADS OR ANY COMBINATION ✳

When You Want To Appeal To The Ladies... Consider KYS-ITE

... as they will!

Ladies (bless 'em) are creatures of impulse. Show them an item that's beautiful as well as practical . . . and how they go for it!

The sales appeal of many a product* can be traced to KYS-ITE's winning ways with women. Let us tell you, for instance, of the amazing sales record made by this maple-finish bowl. For, like all KYS-ITE, its rich, smart colorings are at home in style-conscious surroundings . . . and what woman won't applaud KYS-ITE's easy cleaning qualities, its stubborn resistance to abrasion or breakage.

*KYS-ITE all-purpose bowls, radio cover assemblies, high chair trays . . . just a few examples of how this plastic has been used to favorably influence retail buyers. Why not let KYS-ITE give your product the selling advantages so necessary as competition stiffens.

Now for the Engineer's side . . .

Have you an unusual molding problem . . . an item that perhaps looks impossible to produce? Many an engineer, designer or manufacturer can tell you they've been in the same boat. But Keyes molded their piece in KYS-ITE . . . taking advantage of the KYS-ITE combination of properties which no other type of material can offer.

Our problem-solving experience on widely varied products should prove helpful. Why not consult us on custom molding to specifications?

KEYES FIBRE COMPANY
420 Lexington Avenue
New York 17, New York
Plant at Waterville, Maine

KEYES
MOLDED PRODUCTS

KYS-ITE

(Reg. U. S. Pat. Off.)

Preformed Plastic Combining Long-Fibered Wood Pulp and Synthetic Resin

STURTEVANT

Rotary Fine Crushers

Provide Granular Products Without Excessive Dust

These fast, highly efficient crushers are designed to crush or granulate soft and moderately hard substances to fine even sizes without large amount of dust. They effectively handle materials up to and including the hardness of the softer limestone or cement clinker. The fineness of product is regulated by a hand-wheel. They produce a dependable quality of output from one inch to a quarter inch. Capacity ranges are available from one to 30 tons per hour depending on size of machine. Open door accessibility allows entire crushing area to be exposed for quick, easy cleaning. Write for information.

JAW CRUSHERS

for coarse, intermediate and fine reduction of hard or soft substances. Heavy or light duty. Cam and Roller action. Special crushers for Ferro-alloys. Several types, many sizes.

RING-ROLL MILLS

for medium and fine reduction (10 to 200 mesh), hard or soft materials. Very durable, small power. Operate in closed circuit with Screen or Air Separator. Open door accessibility. No scrapers, plows, pushers, or shields.

CRUSHING ROLLS

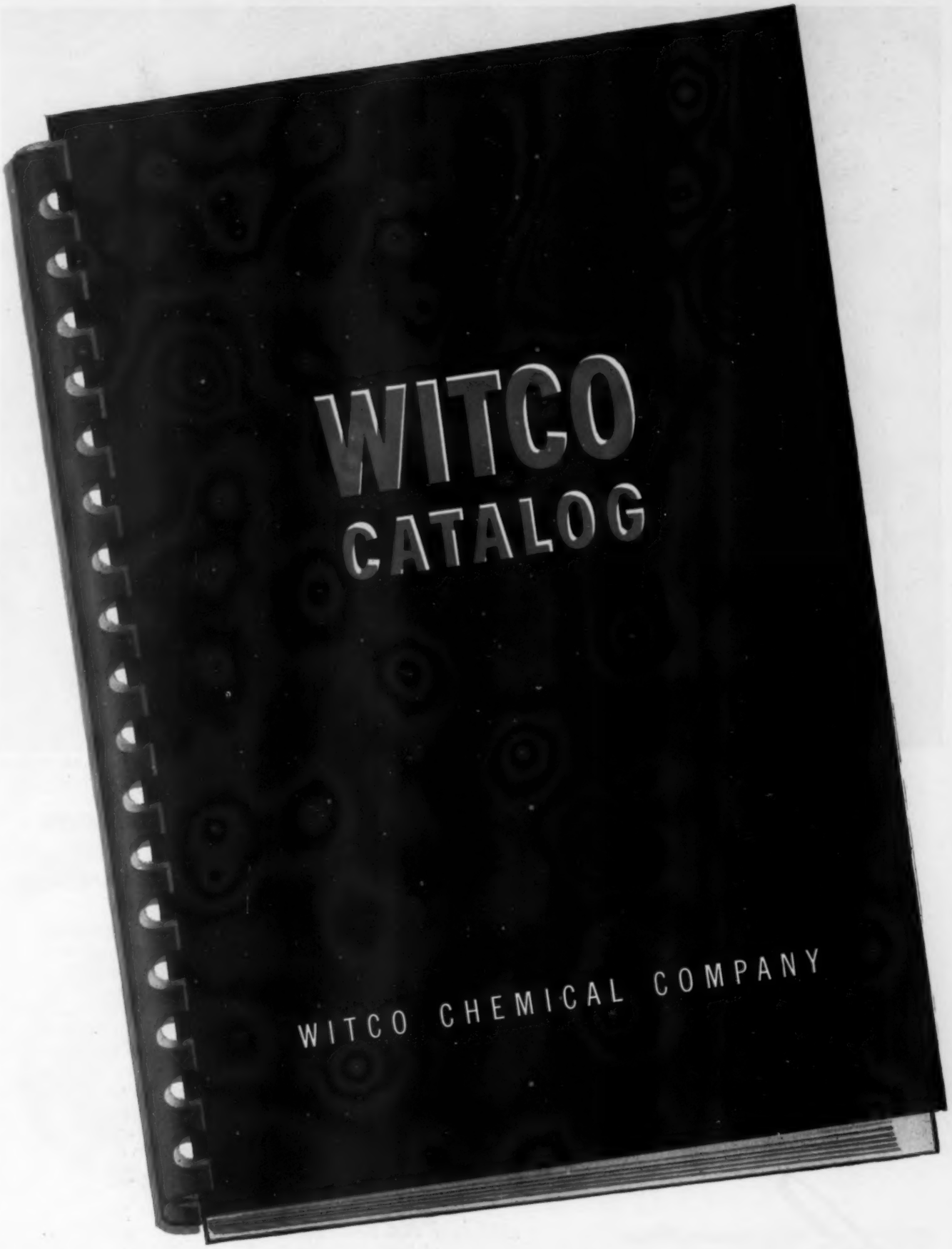
for granulation, coarse or fine, hard or soft materials. Precision and automatic adjustments. Crushing shocks balanced. For dry or wet reduction. Sizes 8x5 to 38x20. Roller or Plain bearings. The standard for abrasives.

STURTEVANT MILL COMPANY

110 Clayton Street, Boston 22, Mass.

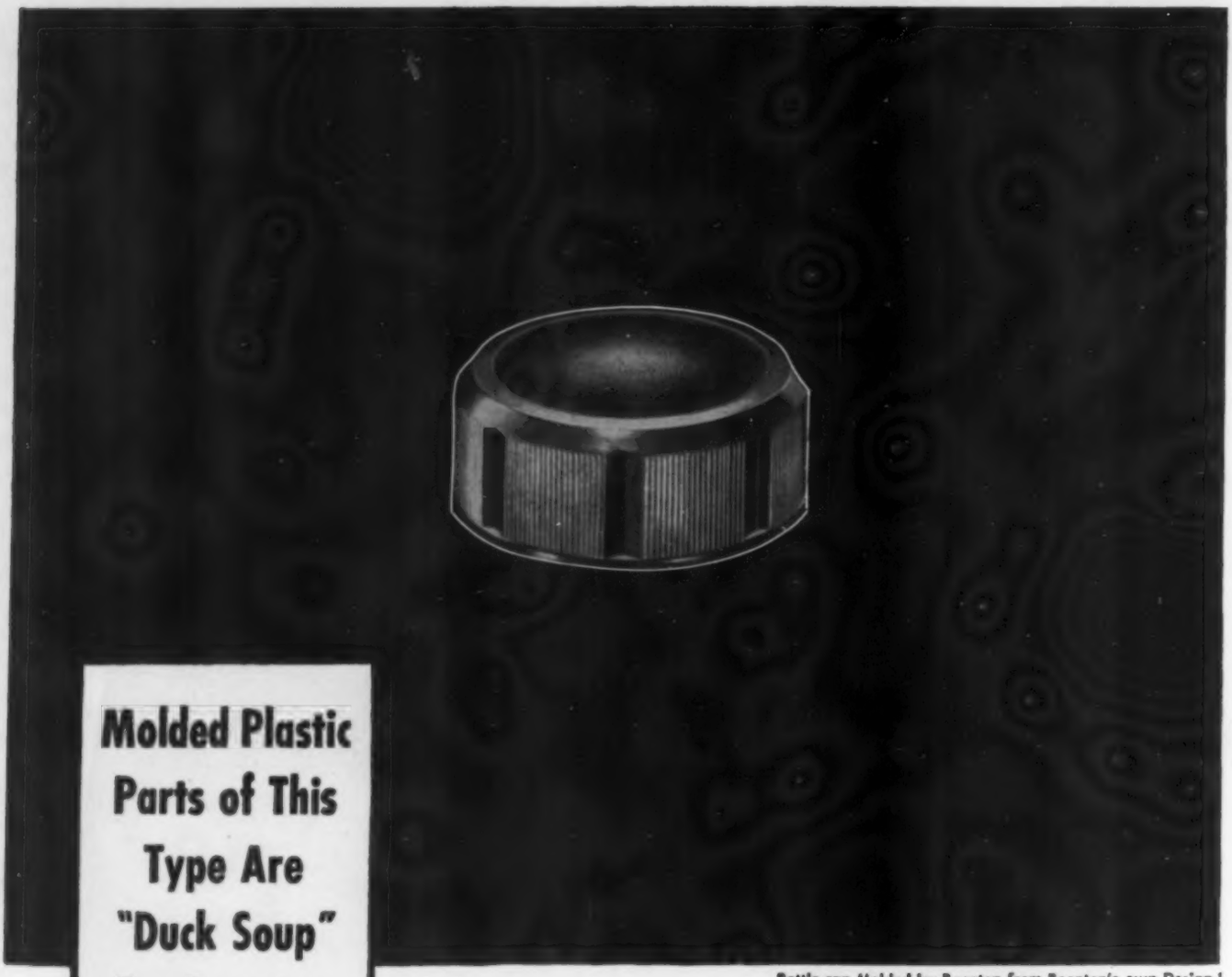
Designers and Manufacturers of

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS • ELEVATORS • LABORATORY EQUIPMENT • MECHANICAL DENS AND EXCAVATORS • MIXERS



Send for your copy of the completely revised edition just published . . .

WITCO CHEMICAL COMPANY
295 Madison Avenue, New York 17, N. Y.



Molded Plastic Parts of This Type Are "Duck Soup" For Boonton

Bottle cap Molded by Boonton from Boonton's own Design !

Have you a Production Problem that Molded Plastics might solve?

Possibly you'll never need a bottle cap, but this fact may be of interest to you: The bottle cap shown was molded on our fully-automatic presses — 100 per minute — 140,000 per day.

Does this production capacity suggest a need you have for small or large molded plastic parts — in medium or large runs? While this bottle cap is automatic compression molded, perhaps your product could be produced better, at less cost, by transfer, plunger, or injection molding. At Boonton, we mold from all major raw plastics, by any of the 4 major molding methods.

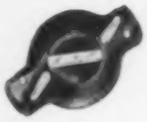
Many of our customers have saved substantial sums of money by asking our engineers to talk to their engineers before their products reached the purchasing stage. They've been amazed and pleased at the ways we've come up with design and production suggestions that shaved costs all the way around. Perhaps we can do the same for you. Maybe we've learned something in our 25 years of molding plastics that can be helpful to you. We'll be glad to share this experience with you. Write or phone The Boonton Molding Company, Boonton 3, N. J., Boonton 8-2020.

Boonton

FREE to Prospective Buyers of Molded Plastics "A Ready Reference for Plastics". Get this 80-page book. Factual data on design, comparative plastic properties, molding methods.

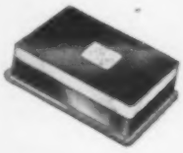
MOLDERS OF MOST PLASTICS BY MOST METHODS

MECHANICAL strength can be added to molded parts without burdensome weight. Inserts for fastening or structural reinforcements are light, strong; available in many cases from stock.

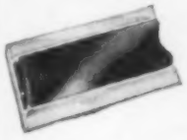


ELECTRICAL conductivity of aluminum is high. Perhaps you're thinking about a molded plastic electrical part where aluminum inserts provide the necessary conductivity. They're strong, too!

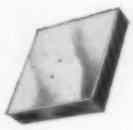
THERMAL properties of aluminum are excellent. Let's say you're designing a plastic product which must be air-cooled. You might use aluminum discs, molded in, as at left.



DECORATIVE values of aluminum are a long story in themselves. Use it plain, or with frosty or mirrorlike Alumilite or colored finish (patented process). Remember, it's light!



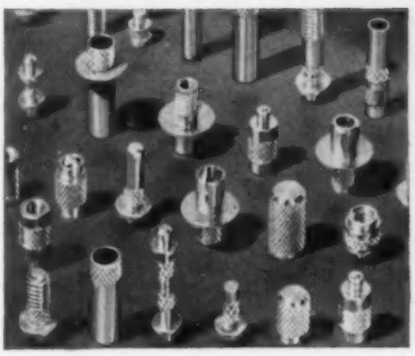
EXTRUSIONS of plastic combined with extrusions of aluminum? Why not? One supplements the other, in beauty and strength. Alcoa Aluminum is available in many stock shapes.



LAMINATED plastics can be faced with aluminum sheet for a new idea in modern materials. Or, why not inset Alcoa Aluminum decorations in your dark laminates? Attractive!

FORMED plastic sheets team up well with Alcoa Aluminum, as in this navigator's dome. The whole assembly is light, strong, easy to mount. Is there a household idea here?

CHEMICAL properties of aluminum supplement those you like to stress in plastics. Can it help you in products for textile, process, petroleum, pharmaceutical, food industries?



when inserts are ALCOA ALUMINUM

LOWER COST PER PIECE! Alcoa Aluminum weighs only one-third as much as most metals, gives you three times as many inserts per pound. That means your costs per insert are actually lower than heavier metals that cost less per pound, but yield only one-third as many inserts.

TEAM UP NATURALLY! Alcoa Aluminum inserts shrink at the same rate as the plastic in cooling, preventing stresses and cracking. Aluminum helps cut rejects, save money.

HANDSOME APPEARANCE! Alcoa Aluminum is available in a variety of forms and finishes that combine well with the modern design of today's molded plastics. Bare-bright, satin-buffed, or Alumilite* finishes are available. Your insert manufacturer can supply stock inserts and information. Or write ALUMINUM COMPANY OF AMERICA, 2175 Gulf Building, Pittsburgh 19, Pennsylvania.

*Patented Process

ALUMINUM PLASTIC TEAMWORK PAYS OFF!

ALCOA FIRST IN ALUMINUM

ALCOA ALUMINUM 1888 1948 60 YEARS OF SERVICE

THE CARVER LABORATORY PRESS

CLP's in use

..... ***in the development laboratory of The BG Corporation, to form plastic and ceramic materials in dies; for extrusion, pressing, swaging and drawing.***

This prominent manufacturer of aviation spark plugs has found the Carver Laboratory Press to be the ideal general utility press for laboratory research and development.

STANDARD FOR RESEARCH AND DEVELOPMENT

New applications are always being found for the Carver Laboratory Press in plastics research and development. Small and powerful, the Press is standard equipment in the industry. Carver Standard Accessories, all available from stock, include Electric or Steam Hot Plates, Carver Test Cylinders, Swivel Bearing Plates, Cage Equipment, etc. Used for quick, accurate pressing tests; research and instruction work; testing single cavity molds; preparation of samples; and even for small scale production. Send for catalog.

The Carver Press is a complete, self-contained hydraulic unit. Accurately controlled pressures to 20,000 lbs.; 6-inch gauge is rigidly mounted on base. Special gauges are available for low pressure work.

FRED S. CARVER INC
HYDRAULIC EQUIPMENT
343 HUDSON ST. NEW YORK 14, N. Y.

Who put the elephant behind the 8 ball?

In 1869 the first billiard ball to be molded from plastics made its appearance as a substitute for the rapidly dwindling supply of ivory. From such modest beginnings the plastics industry has developed to a point where its importance to modern life is undeniable.

For almost 35 years The Watertown Manufacturing Company has played an important part in this progress. In 1915 Watertown developed the popular Neillite, one of the first phenolic compounds to be used commercially. Since then it has kept abreast of all new developments, and in many instances has pioneered its own. During the process it has developed a staff of trained workers whose experience in molding plastics totals more than 2000 years.

When you bring your plastics problems to Watertown you know that these many years of experience in molding difficult and intricate parts is part of the service you get. Watertown's modern facilities offer the best in products custom molded from all types of thermosetting and thermoplastic materials.

A "PLUS" Watertown Service

Periodic testings of all molded parts from basic material to finished product are routine in Watertown's completely equipped laboratory. Accurate readings in flexural, tensile and compressive strengths, as well as stress and strain curves are obtained from a machine specifically designed for the fatigue testing of plastics. Fissures, porosity and stray metal inclusions are detected by a new electronic X-ray unit.

THE WATERTOWN MANUFACTURING CO.
1000 ECHO LAKE ROAD, WATERTOWN, CONNECTICUT

Watertown
A NAME AS OLD AS THE PLASTICS INDUSTRY

INCREASES PRODUCTION up to 500%

PORTER-CABLE B-6W WET-DRY FLEXIBLE BELT SURFACER

Removing parting lines on plastic hand form. Note how belt follows contours, gets into close places. Belt was scived at sides to prevent digging in at corners. Production stepped up 500%.

User made simple jig to hold discs which were too small to hold by hand.

On this simple holder, piece revolves when pressed against belt. Note perfectly round, uniform finish over the entire contour.

Makes Clean-up Operations Profitable!

No warpage, no discoloration. Reduces spoilage to absolute minimum. Grinds, sands, polishes and finishes curved, flat and irregular surfaces. Operates on platens, free hand or with simple fixtures.

Operates on free, flexible belt — The fast B-6W increases production and improves the quality of your work but it also does a lot more. It gets into places otherwise inaccessible. The ½" to 3" wide belt is flexible. It follows contours and sharp turns. And polishes off difficult surfaces up to 500% faster.

Operates with variety of backing plates — These plates can be made up to fit grinding jobs. Rounds for arcs of various diameters . . . flats . . . "V's" . . . anything to fit the contour of work piece. Several shapes may be put on one backing plate. Padded platen and fine belt (used wet) produce beautiful finish on plastics.

Operates with simple jigs and holders — The kind of fixture required is determined by the results desired. See the small illustrations.

FOR BIGGER PROFITS — WRITE TODAY for movie film — "Machine of the Age" — loaned free for staff meetings. Shows how to increase production.
ALSO — free literature on Wet-Dry Belt Machining.
SEND US SAMPLES OF YOUR WORK. Our free methods analysis can help you save production time.

PORTER-CABLE MACHINE COMPANY
1606-4 NORTH SALINA STREET, SYRACUSE 8, N.Y.

All America is reading ads like this!

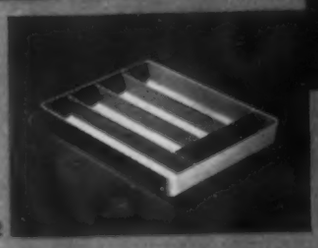
Let's go selling STYRON

DOW'S FAMOUS PLASTIC

Here's another reason why molders are turning to Styron (Dow Polystyrene) for products that *sell!* Aggressive advertising and promotion are constantly strengthening Styron's position as America's No. 1 plastic. This month all America is reading four-color advertisements in the best national magazines . . . all America is shopping for Styron in leading stores which are tying in with this big housewares promotion. And this is *only the first* of several big Styron campaigns! For better products—for greater sales—tie your product to this popular name. Let's go selling *better* plastic products . . . "made of Styron"!

Illustrated at right: Colorful bowls with Tupper Seal by Tupper Corporation. Re-Fresher Box by The W. & A. Company for Ruzak Industries, Inc. Kitchen Knife Set with Styron handles by Lanfare Molded Products for The Clyde Casting Co. Novel Egg-Cessory egg cups by American Injection Molders, Inc.

1



2

3

4

5

6

1. **FLOWER POT AND BASE** in a wide choice of colors and in three convenient sizes. Made of Styron means no chipping or peeling. By R. P. Place Co.
2. **CUTLERY TRAY** is just the thing to bring order to the kitchen drawer. Lightweight, durable and colorful, it appeals to the "good housekeeper." By General American Transportation Corporation.
3. **"STOWAY" UTILITY DISH,** with its tight-fitting cover keeps left-over foods, fruits and other edibles fresh and wholesome. By Southern California Plastic Company.
4. **"PI-PAK"** is neatly designed to hold a piece of pie, a sandwich or other foods in a lunch box. Available in a choice of colors. By Sun Plastics for The Hut Kun Company.
5. **"ICINGLES"** are colorful individual ice molds for the refrigerator tray. Attractively boxed in sets of 12 with stirring spoon. By Spir-it, Inc.
6. **BUFFET TRAY** makes serving of drinks and snacks easy. And bright Styron colors add a note of gaiety, too. By United Plastic Industries.

MADE OF STYRON

DOW

Take Advantage of Promotions like this . . . Tie in with

PLASTICS DIVISION, DEPT. HW-27 • THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

FOR YOUR INFOR M ATION

SIX WAYS MONSANTO HELPSTS

Monsanto's full-fledged, hard-hitting promotion campaign is a *proved success* in helping the plastics industry move goods. Underway for years, the program is still increasing momentum . . . now when *selling* is most important. Already hundreds of Monsanto customers have benefited. Find out how the six-point program sells plastics from every angle . . . including yours.

1 Plastics Merchandiser

First of its kind . . . unique in its field . . . Monsanto's Plastics Merchandiser really *sells*. Each edition contains at least thirty sales promotion sheets . . . and each sheet features a large photograph of a customer's product with a complete, selling, product description and the names and addresses of manufacturers or selling agents.

The Merchandiser is mailed periodically to about 5,000 buyers all over America who are the heart of plastics industry's markets. Its circulation is restricted to the volume buyers of merchandise in leading department stores, chain stores and mail order houses.

Your product . . . in this famous Merchandiser . . . gets a *proved, direct . . . emphatic* "sell" with important volume merchandisers from coast to coast. Let this Merchandiser, with its proved, accepted entree to your markets, make your selling trips for you.

News about Plastics from Monsanto Chemical Company | **APRIL...1948**

STS CUSTOMERS MOVE GOODS

2 National Advertising

Monsanto's *national magazine advertising* sells plastics' products directly to consumers and important merchandisers. Plastics' products are featured, identified and *sold* in beautiful 4 color advertisements in Saturday Evening Post, Better Homes and Gardens, Time, Newsweek, Fortune and Business Week. Full-scale trade advertising sells products of Monsanto customers to many industries.

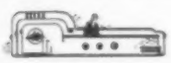
3 Reprints

For powerful direct mail advertising, and a major promotion device, customers are supplied with reprints of Monsanto's colorful advertising featuring their products.

4 Technical Council

To "quarterback" your merchandising, a ten-man council of experts gives advice on materials *and* sales problems. Now in its third year of service to Monsanto customers.

5 Displays



Products of Monsanto customers are featured, identified and *sold* in annual national sales shows and in Monsanto's many sales offices throughout the world.

6 Publicity

Trained Monsanto staff members supply pictures and stories of Monsanto customers' new products to editors of leading newspapers, wire services and magazines.

What molders say

Case histories showing how Monsanto helps molders sell are shown in these typical comments among hundreds in Monsanto's files:

•

"I wish to say that the publication of the attached sheet in your Plastics Merchandiser resulted in approximately 150 inquiries."

•

"... of all the trade advertising we have done in the past, we have never received as many inquiries which have resulted in sales as were received from this particular ad."

•

"We received more inquiries from the publicity you gave us ... than from any other type of publicity released by other companies ... we received over 100 inquiries altogether."

•

"We have received inquiries from all parts of the world."

•

"... we received many inquiries as a result of this backing. Several of them were from chain stores and many of them from department stores."

• • • • •

Monsanto's merchandising program is a "package" which can help you move goods. This program is backed to the hilt as a cooperative promotion ... for selling which helps Monsanto's customers also helps Monsanto. The convenient coupon will tell you how Monsanto will help *you* boost sales.

MONSANTO
CHEMICALS — PLASTICS

SERVING INDUSTRY...WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY, PLASTICS DIVISION
Dept. MPLP4, Springfield 2, Mass.

Please send me
- ☐ general information on Monsanto's merchandising program.
- ☐ I am enclosing a sample of a product molded with Monsanto plastics and wish merchandising help.
- ☐ General information on Monsanto's twelve basic plastics.

Name _____ Title _____

Firm _____

Type of Business _____

Address _____

City _____ State _____

Let Pure Nickel PROTECT YOUR PHENOL-FORMALDEHYDE PLASTICS

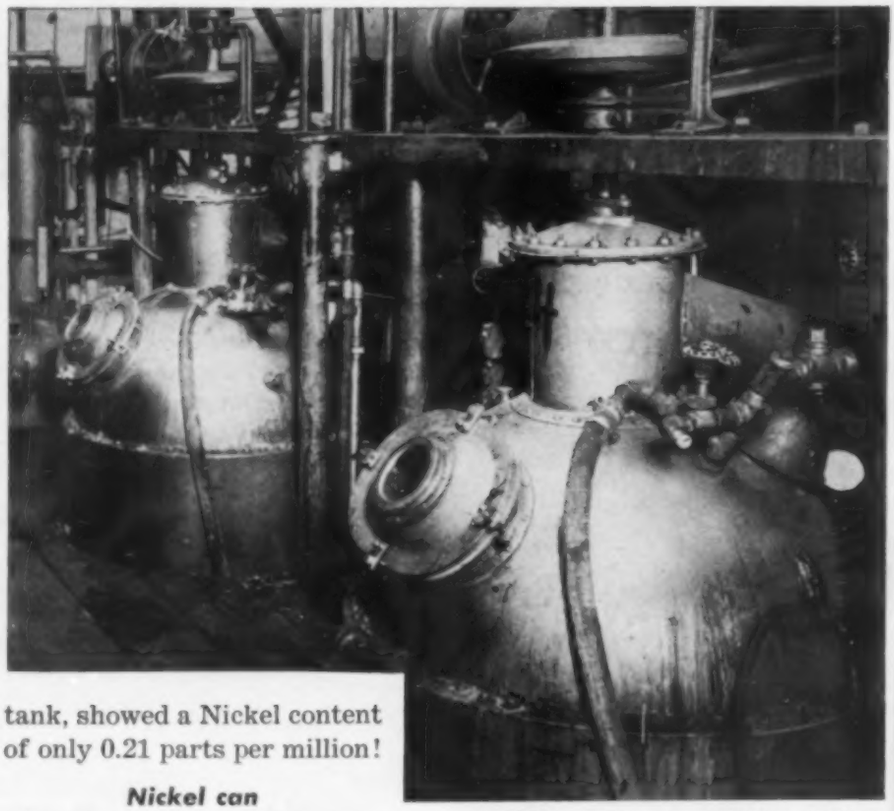
Here's why pure Nickel has been standard ever since clear, transparent plastics and resins were first produced:

Nickel's high degree of corrosion resistance keeps metal pick-up down; it assures purity, uniformity and color protection during all stages of production, handling, transportation and storage.

Nickel has good heat transfer properties, too. It finds wide application in the production of high purity phenol—stills, condensers, and reactors operating at high temperatures and pressures.

Temperatures in storage tanks, naturally, are not so high—*but contact may be for long periods.* Corrosion which might not damage the equipment itself to any great extent is undesirable because it means product contamination. It is here that Nickel storage tanks — as well as Lukens Nickel-Clad Steel tanks and tank cars — are exceptionally valuable.

At one large plastics plant, for example, analysis of a representative phenol sample after 28-day storage in a 10,000-gallon Nickel-Clad tank, showed a Nickel content of only 0.21 parts per million!



JACKETED NICKEL PROCESSING KETTLES for phenolic plastics. Nickel not only resists corrosion by phenol, but also by formaldehyde and the mixtures encountered before and during processing operations.

Nickel can improve your product, too

If corrosion dims the sparkle and lustre of your finished product, turn to Nickel. It has countless applications in the processing of phenolics.

Standardize on this strong, corrosion-resistant metal for your holding and mixing tanks, pipe lines and pumps . . . for kettles, escape lines, condensers and storage tanks.

With Nickel on the job, you can be *sure* of protection against metallic contamination.

TYPICAL PHENOL STORAGE TANK built of light-gauge Nickel sheet, reinforced with steel. Analysis of phenol after a month's storage showed only 0.21 parts per million of Nickel. *Photo courtesy Whitlock Mfg. Co., Hartford, Conn.*

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.

Standardize on PURE NICKEL . . . where PURITY counts

INCO TRADE MARK

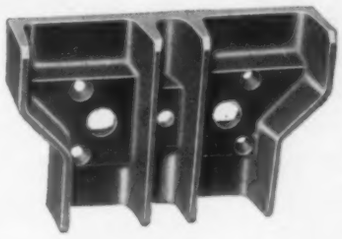
CUSTOMERS

BOTH KINDS

value

Norton experience

COSMETICS



INDUSTRIAL

● When customers ask us whom we do business with, we can do more than mention names they are sure to recognize. We can show them how we've worked with people whose problems are similar to theirs... engineering or packaging problems successfully met with fine moldings.

That's one of the real advantages of having Norton for your molder ...our broad experience.

How will the molding be used? Must it have superior electrical or mechanical properties, or a combination of both? How important is display value...color...style? Shall we mold by compression or extrusion? Experience can provide the right answer in the least time, and our design engineers and technicians have been acquiring this since the industry was an infant.

Two new "right answers" are this complex heavy-duty insulating block for the Safety Car Heating & Lighting Co., and the sifter powder-box top for a famous cosmetics house.

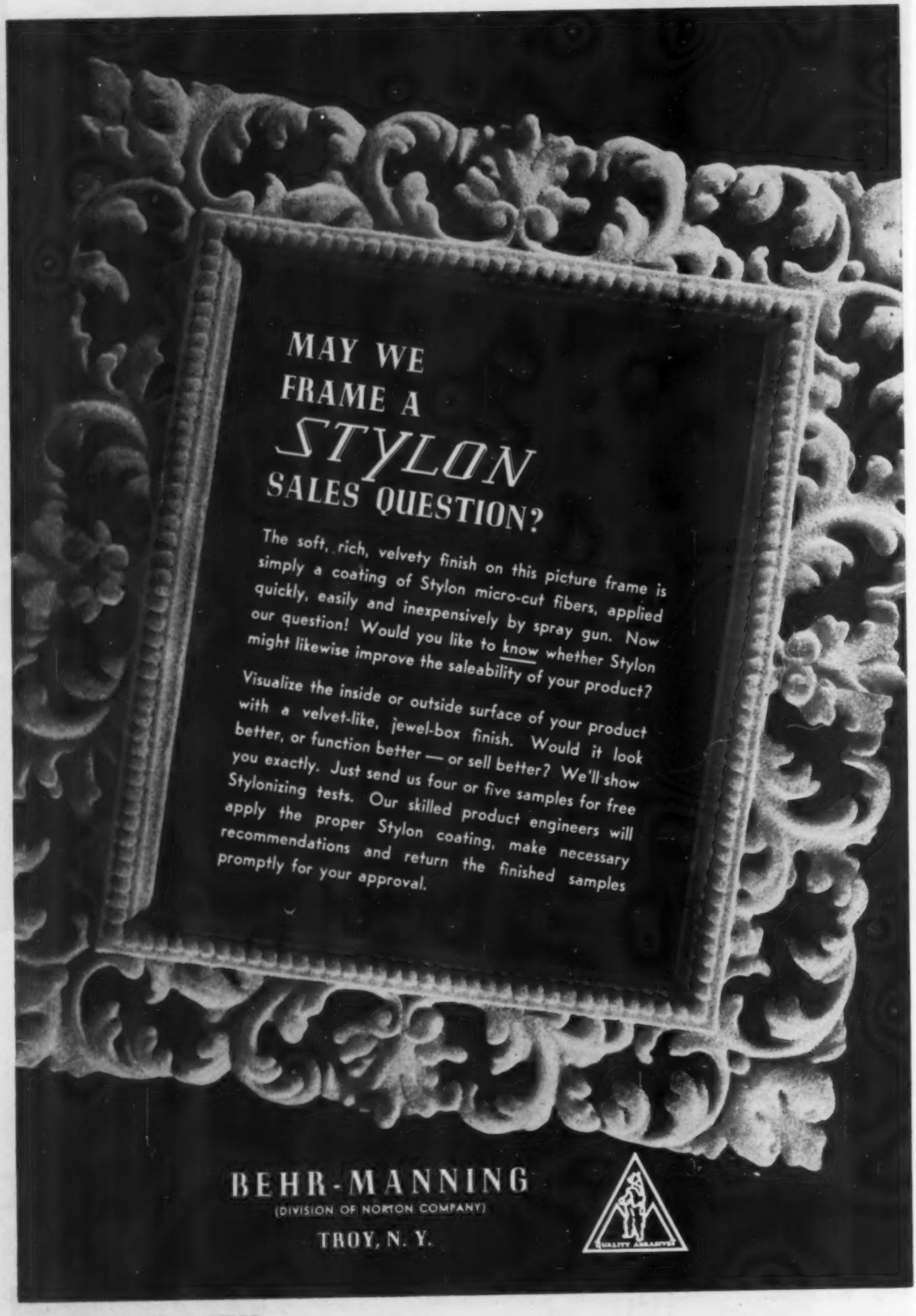
Bring your plastics problems to a molder with a proved record and broad experience...a molder who serves prominent manufacturers in practically every field of industry. We're ready to serve you with skill and with speed. Norton Laboratories, Inc., Lockport, N. Y. *Sales Offices in New York City and Chicago.*

NORTON *Laboratories, Inc.*

SPECIALISTS IN FINE CUSTOM MOLDING

WE'LL PAY YOU $100.00 for a bona-fide plastic molding problem we can't solve.

Toss that really tough one into our lap. If we can't produce what you want, and if any other molder produces it successfully within 12 months, we'll send you a $100 check on receipt of proof. Problems must be submitted not later than July 1, 1948. You have to be good to make


MAY WE
FRAME A
STYLON
SALES QUESTION?
The soft, rich, velvety finish on this picture frame is simply a coating of Stylon micro-cut fibers, applied quickly, easily and inexpensively by spray gun. Now our question! Would you like to know whether Stylon might likewise improve the saleability of your product?
Visualize the inside or outside surface of your product with a velvet-like, jewel-box finish. Would it look better, or function better — or sell better? We'll show you exactly. Just send us four or five samples for free Stylonizing tests. Our skilled product engineers will apply the proper Stylon coating, make necessary recommendations and return the finished samples promptly for your approval.
BEHR-MANNING
(DIVISION OF NORTON COMPANY)
TROY, N. Y.
QUALITY ABRASIVES

mold thermosetting materials on the ROCKFORD HY-JECTOR

- to eliminate all intermediate handling
- to prevent losses from moisture absorption
- to control variables in powder

When you figure a job to the fraction-of-a-cent-per-finished-part, the ROCKFORD HY-JECTOR gives you three all-important advantages. Because the machine performs all steps in a production cycle from powder to finished part, in a fast, uninterrupted sequence . . . the costs resulting from the numerous handling steps in conventional molding practice are completely eliminated. With the ROCKFORD HY-JECTOR the *only* handling required is the initial loading of the powder into the hopper and the removal of the finished parts.

In addition, the ROCKFORD HY-JECTOR cycle eliminates the need for preform storage and thereby the losses from moisture absorption. And because no more than an average of four cycles are ever in process at one time, short or excess preforms due to powder variables are quickly detected at minimum waste of materials. For all the facts about the ROCKFORD HY-JECTOR for thermosetting materials . . . write for Bulletin 147.

ROCKFORD MACHINE TOOL CO.
ROCKFORD • ILLINOIS

4802

ROCKFORD HY-JECTOR

DESIGNED AND BUILT BY
ROCKFORD MACHINE TOOL CO...
MANUFACTURERS OF *Hy-Draulic*
SHAPERS • PLANERS • SLOTTERS
SHAPER-PLANERS FOR METALWORKING

PYRO'S PLANT IS PROLIFIC

The wide variety of jobs that are turned out of Pyro's plant include Industrial Parts, Premium Novelties, Kitchen Wares, Toys, Jewelry, Advertising Specialties, Home and Factory Appliances.

Yet, to Pyro, they are all alike in one respect—they present a challenge to produce the finest product of its type on the market. Into each job goes the same skill, effort and experience. The result: Pyro's name is associated with the finest in custom molding everywhere.

Pyro

PLASTICS CORPORATION 691 CHESTNUT STREET AT ROUTE 29
UNION, UNION COUNTY, NEW JERSEY

PRODUCT	COMPOSITION	B.P. @5mm	SP. GR. @20/20°C	LOW-TEMP. PERFORMANCE	COMPATIBILITY: VINYLS	COMPATIBILITY: CELLULOSE ESTERS*	COMPATIBILITY: SYNTHETIC RUBBERS	OTHER CHARACTERISTICS
"PLASTOLEIN" 9055	diethylene-glycol dipelargonate	229°C	.9640	Excellent	Good	Good*	Excellent	"Plastolein" 9055 has good color (light straw), moisture resistance and working properties.
"PLASTOLEIN" 9058	dioctyl azelate	237°C	.9184	Excellent	Excellent	Good*	Excellent	These two water-white esters of azelaic acid are recommended particularly for transparent, clear films. Impart excellent tear strength. Suggested also for Organosols & Plastisols. Economical . . . less plasticizer per unit of resin.
"PLASTOLEIN" 9050	dihexyl azelate	230°C	.9319	Excellent	Excellent	Good*	Excellent	
						*Except for cellulose acetate		
"PLASTOLEIN" 9715	A resinous plasticizer	Decomposes at B.P.	1.080	Good	Good	Good	Excellent	A resinous type plasticizer, 9715 is low in viscosity and high in efficiency . . . none volatile . . . oil resistant. Can also be used with POLYVINYL ACETATE.
"PLASTOLEIN" 9250	Tetrahydro furfuryl oleate	240°C	.9279	Excellent	Good	Good	Excellent	Emery's 9250 exhibits improved odor, color and color stability for this type of plasticizer. Outstanding for internal lubrication.

LOW-MOLECULAR WEIGHT ALIPHATIC ACIDS

PRODUCT	FORMULA	COMB. WT.	ACID VALUE	SP. GR.	SOLUBILITY-TYPICAL REACTIONS	USES
"PLASTOLEIN" 9110	$C_7H_{14}(COOH)_2$ Azelaic Acid	93 to 97	575 to 600	1.038 @110°C	Azelaic acid is a buff colored solid, insoluble in cold but infinitely soluble in hot water, in alcohol and polar solvents. Reactions are typical of dibasic acids.	Azelaic forms *soft* alkyds. Recommended for manufacture of plasticizing resins, its esters also are excellent plasticizers.
"PLASTOLEIN" 9114	C_8H_{17} COOH Pelargonic Acid	145 to 150	375 to 385	.923 @15.5/15.5°C	A mono-basic acid, very slightly soluble in water but soluble in alcohol and most organic solvents. Forms salts, esters, acid halides, amides, etc. Also available in a purified form, L-288, for perfumes.	Esters of pelargonic acid make good plasticizers while the acid can be used in modification of alkyds, and in the manufacture of essential oils, pharmaceuticals, etc. Recommended wherever short chain saturated aliphatic acids are required.

SPECIAL FATTY ACIDS

PRODUCT	COMPOSITION	TITRE	F.F.A. (as oleic)	ACID VALUE	IV	COLOR GARDNER	TYPICAL CHARACTERISTICS
"PLASTOLEIN" 9315	"Emersol" processed† Vegetable Fatty Acids (Soya type)	5°C max.	98 to 100	195 to 200	145 to 155	4 max.	Much faster drying and higher in amounts of polyunsaturates, than conventional fatty acids of this type, 9315 is considerably less costly. Exceptionally stable to heat and light, 9315 is recommended for air-drying and baking alkyds.
"PLASTOLEIN" 9305	"Emersol" processed† Vegetable Fatty Acids (low linolenic content)	5°C max.	97	192	135 to 140	2 max.	Recommended especially for light-colored finishes, air-drying and baking alkyds. High I.V. but low linolenic content combines excellent drying characteristics with exceptional color stability.

("Emersol" Process—Trade mark of Emery's patented process for separating and purifying fats and fatty acids)

Note: New numbers have been assigned to all Plastolein Products.

EMERY INDUSTRIES, INC.
CAREW TOWER · CINCINNATI 2, OHIO

PLASTICIZERS

STEARIC ACID · OLEIC ACID · ANIMAL AND VEGETABLE FATTY ACIDS · TWITCHELL PRODUCTS · PLASTICIZERS

VOLUME 25 APRIL 1948 NUMBER 8

MODERN PLASTICS

Buttons are Big Business

. . . and plastics, which only got 25% of that business 19 years ago, get 80% of it today

THE average person, if he specifically thinks of buttons at all, thinks of them as small, unimportant things. Webster's unabridged dictionary lists, among the definitions of button: "a thing of small value; as, not to care a button." But people in the button business know better—and most of them are in the plastics industry.

Over 12½ billion buttons were made in the United States in 1947—and about 80% of these buttons were plastic. Obviously the business of manufacturing more than $25,000,000 worth of plastic buttons each year is a substantial and important part of the plastics industry.

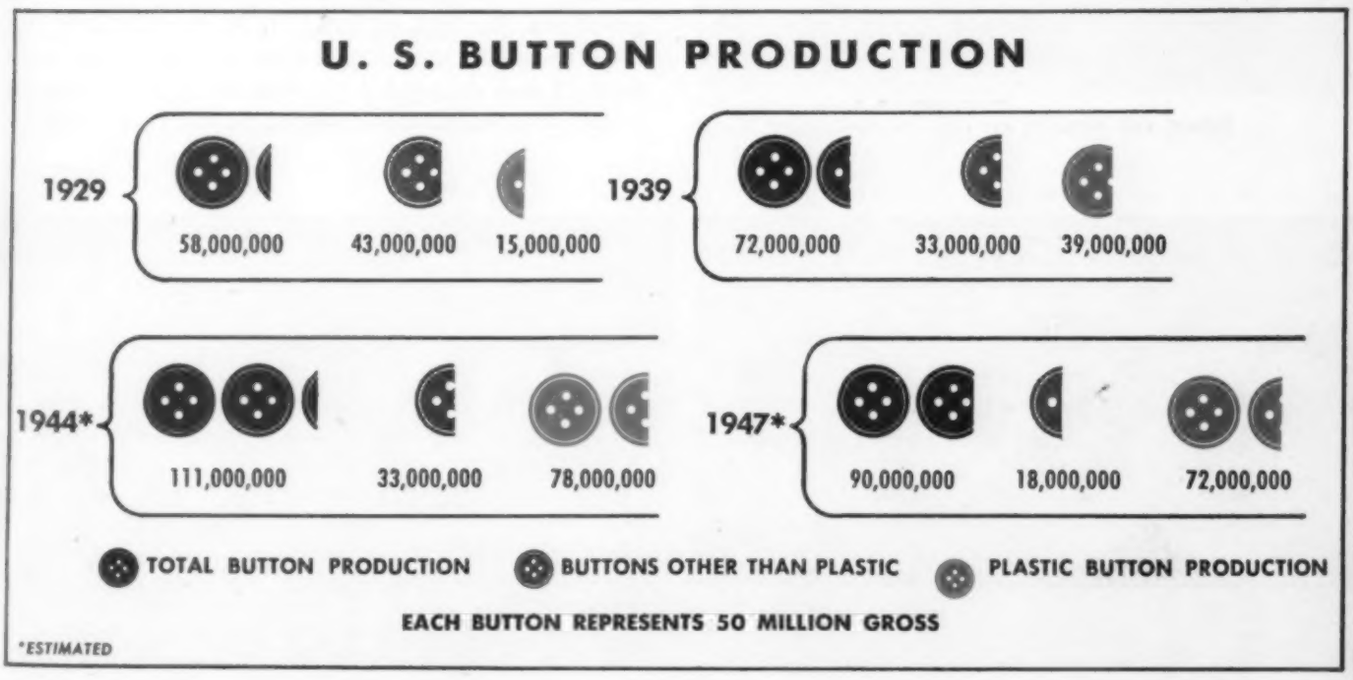
According to one material manufacturer, more urea is used for the manufacture of buttons than for any other single application. And each year the button industry also uses millions of pounds of melamine, phenolics, casein, cellulose acetate, cellulose nitrate, polystyrene, and acrylic.

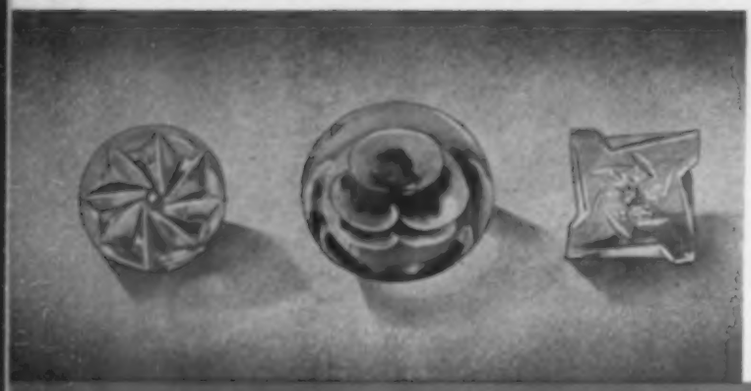
These materials are compression molded, injection molded, or fabricated into some 72,000,000 gross of buttons. Included in this total are some buttons which are strictly functional (for underwear, workshirts, overalls, etc.), some which are almost exclusively decorative in purpose, and many which combine the two functions in various proportions.

Buttons also vary widely in price. Small, simple molded buttons sell for as little as a few cents a gross. At the other end of the scale there are fabricated, multi-colored "fashion" buttons which retail for as much as $1 to $5 *per button.*

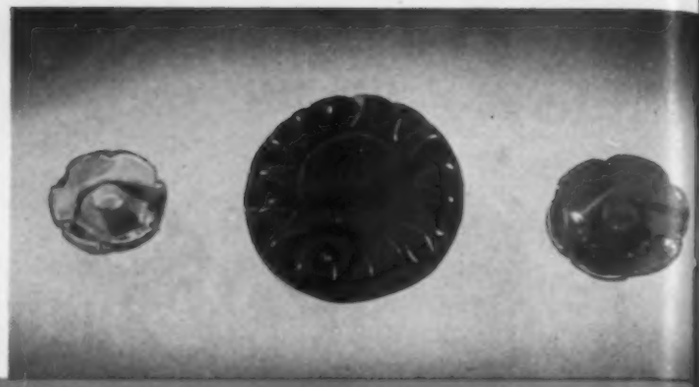
Thus it is difficult to treat the "button business" as a unit. The problems and practices of various manufacturing firms differ as much as the prices and purposes of the buttons they produce. Therefore, any over-all survey of this segment of the plastic industry must of necessity be general.

The story of the growing importance of plastics





FABRICATED ACRYLIC



BUTTONS COURTESY B. BLUMENTHAL & CO., INC.

CAST PHENOLIC

PHOTO COURTESY B. BLUMENTHAL & CO., INC.

Buttons and matching ear ring are hand-twisted plastic

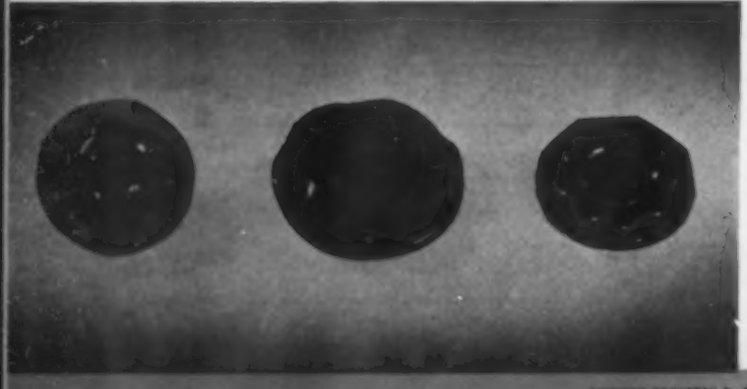
as materials for buttons is one which parallels the experiences of many plastics in other fields. Plastics got their first foothold because of shortages of other materials. But once they got that foothold plastics proved that they could be used to produce a better product at lower cost.

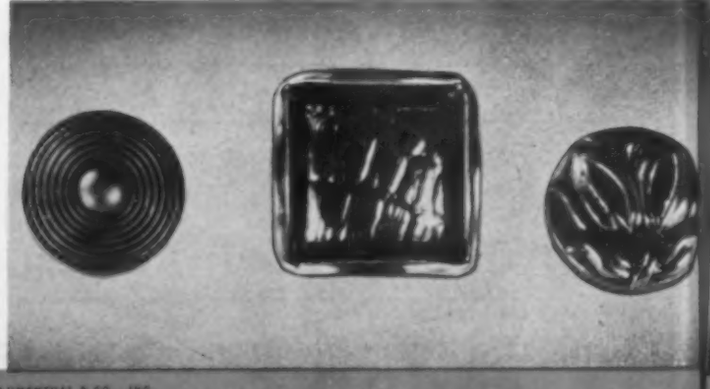
Thereafter plastics captured a larger share of the market each year as better materials became available and as more efficient methods were developed for making buttons out of those materials.

Production figures

The accompanying chart shows how far plastics have progressed in the button industry in the past 19 years. In 1929, the total U. S. production of buttons amounted to 58,000,000 gross, of which only 15,000,000 gross (or a little more than 25%) were plastic. By 1939, total annual production had increased to 72,000,000 gross, 54% of them plastic.

U. S. button production reached an estimated peak of 111,000,000 gross in 1944 as a result of accumulated civilian demand and continued military needs. In that year, 78,000,000 gross of plastic buttons were produced (or 70% of total U. S. production). By 1947, according to best available estimates, total production had dropped somewhat to 90,000,000 gross —the level which most experts in the business con-





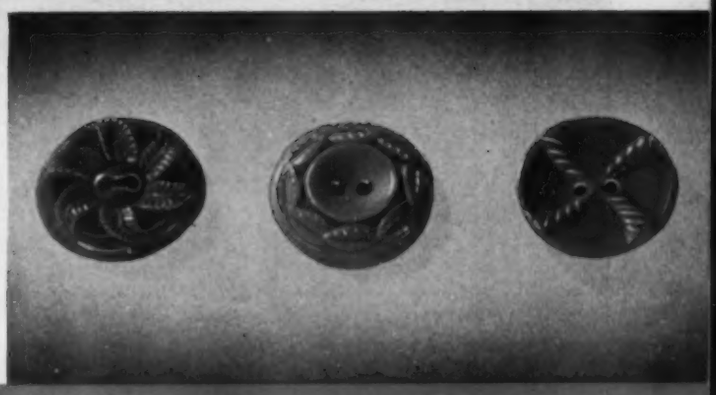
BUTTONS COURTESY B. BLUMENTHAL & CO., INC.

CASEIN

LACQUERED (LEFT) AND PLATED CELLULOSE NITRATE

BUTTONS COURTESY B. BLUMENTHAL & CO., INC.

CELLULOSE NITRATE



UREA

sider normal or slightly above normal. Plastic button production also dropped, but not as sharply as did total production. The 72,000,000 gross of plastic buttons produced in 1947 represented 80% of the total U. S. production.

In other words, despite the ups and downs of the button business, plastics have steadily increased their share of the market. Plastic button production was 25% of the total in 1929, 54% in 1939, 70% in 1944, and 80% in 1947.

Buttons for export

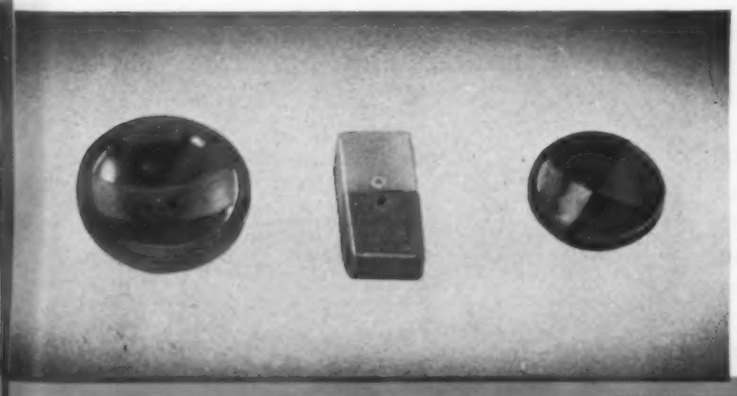
Plastic buttons are also an increasingly important factor in the export picture—and exports are becoming an increasingly important part of the button business. In 1939, when total U. S. button production amounted to $25,500,000, button exports were an insignificant $496,475. Less than 48% of the exported buttons were plastic.

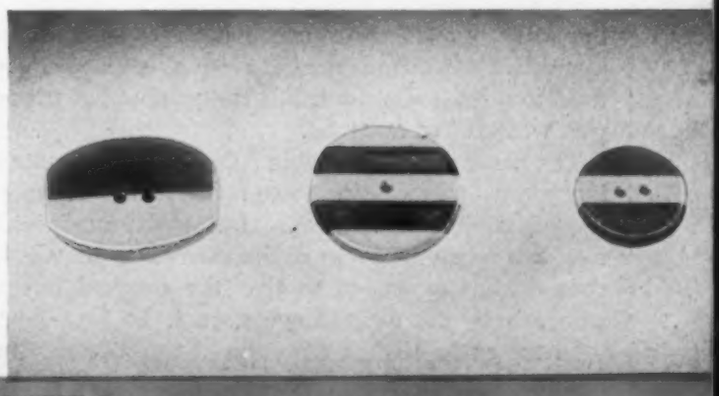
Today the export picture is different. In the first six months of 1947, over $3,000,000 worth of buttons were exported—and 84% of them were plastic.

This increase in button exports is partially a result of the fact that the button industries of Czechoslovakia, France, and Japan were crippled by the war and our own manufacturers were able to capture their markets. However, the price ad-

PHOTO COURTESY B. BLUMENTHAL & CO., INC.

Contrasting color is wiped on decorative molded buttons





BUTTONS COURTESY PLY-TEX MFG. CO.

FABRICATED CAST PHENOLIC AND WOOD

FABRICATED TWO-COLOR CAST PHENOLIC

Card helps dry cleaners identify polystyrene buttons. Bulletin advises removal of such buttons before cleaning

vantages which resulted from the use of plastic materials and molding techniques were also an important factor.

Plastics enter the field

Plastics first entered the button picture about 25 years ago because of shortages of large vegetable ivory buttons. The short supply resulted from the fact that the size of the ivory nuts limited the number of large buttons which could be cut from each nut. And the supply of nuts, which were imported from South America, was also limited. Thus there were periods when large vegetable ivory buttons (for overcoats, etc.) sold for as much as $10 a gross.

Manufacturers tried to fill the need for large buttons with plastics, but the first attempts were far from satisfactory. Molded phenolic buttons lacked the color and appearance which consumers demanded. Casein buttons, cut from sheet stock, were used to a limited extent, but the production process was wasteful of material.

The first really acceptable substitute for vegetable ivory was the casein button fabricated from extruded rod stock. Casein buttons found wider markets when ways were discovered to mottle the rods during extrusion so that the finished buttons would have the desired eye appeal.

In the early 1930s urea entered the picture. Urea materials themselves were more expensive than vegetable ivory, but the labor costs necessary to make the buttons were so low that finished urea buttons were far more economical than those made either from casein or vegetable ivory.

Thermosetting buttons

Today urea buttons have taken over practically the entire market for many of the staple buttons, the design of which does not change materially from year to year. Examples of staple buttons include such items as men's suit and coat buttons, suspender buttons, underwear buttons, simple wash-dress and apron buttons, etc.

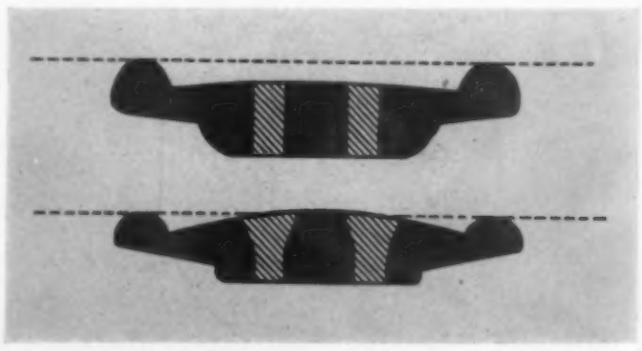
Casein buttons cannot take the frequent launderings which many such buttons get, nor can casein compete with urea in price. However, casein buttons still find markets because of their superior color possibilities. They are used where considerations of appearance are important enough to justify a higher price—particularly on sweaters, rayon blouses, sport shirts, and other garments which are not normally subjected to rough laundering. One of the big uses for casein buttons is on women's coats.

For applications where a stronger button is required—or one with even greater washability than urea—melamine is fast becoming a popular material. By far the most important use for melamine buttons is on men's shirts.

Cost is the most important advantage which melamine shirt buttons have over natural pearl. The buttons made from the natural shell cost about $2 a gross as against 16¢ a gross for melamine.

Of course the melamine buttons cannot duplicate the pearlescent effect of the natural material. But this factor seems unimportant when one considers that all the buttons on a man's shirt are normally hidden by his tie. Furthermore, the pearl buttons will become dull, delaminate, and break after a number of washings. Melamine buttons not only are less susceptible to breakage, but, according to many manufacturers, will take on a higher gloss with each washing.

It is therefore surprising that many shirt manufacturers are still willing to pay a higher price for pearl buttons. Some of them perhaps prefer to offer pearl buttons with initial beauty (which the poten-



DRAWING COURTESY EMSIG MFG. CO.

Top button will break under 75 lb. pressure. Bottom one, made of same material, will withstand over 1200 pounds

tial shirt buyer can see) rather than melamine buttons with durability (a quality which the buyer cannot see). Others perhaps pay the higher price in order to be able to use the words "genuine pearl buttons" as a selling point. The fact that a "genuine pearl" button is not as good as a melamine button does not make the selling point less effective.

Thermoplastic buttons

Most of the buttons molded of thermosetting materials are functional rather than decorative. A few can be classified as decorative—but they are the simplest type of decorative button.

Injection molded buttons, however, are usually primarily decorative in purpose. The reason for this is one of production economics. There is a market for tremendous quantities of functional buttons and their design does not change from year to year. Thus it is possible to utilize compression molds with a large number of cavities (650-cavity dies are not unusual) and to continue to use the same molds for many years.

Decorative buttons, on the other hand, have a relatively limited market and frequent design changes are necessary. This makes it more economical to use injection molds with 10, 20, or 30 cavities rather than compression molds with hundreds of cavities. The injection molds are usually used for two or three years, then sold for use abroad.

Design is also a factor. Many decorative buttons have numerous small cut-throughs which require thin mold sections. To produce such buttons by compression molding would be impractical.

More decorative buttons than can be produced by injection molding are produced by fabrication. Acrylic is a popular material for this type. Fabricated buttons often use two or more colors or use plastics combined with other materials.

The button controversy

At present, most injection molded buttons are made of cellulose acetate. Many transparent buttons are molded of polystyrene but the manufacture of opaque polystyrene buttons has been discontinued as a result of a recent agreement between the button committee of S.P.I. and the National Institute of Cleaning and Dyeing.

Some time ago the N.I.C.D. began distributing literature warning the personnel of cleaning establishments to watch out for "plastic buttons," stating that they could not withstand dry cleaning. The S.P.I. button committee contacted the N.I.C.D. in order to prevent this wholesale condemnation of *all* plastic buttons. The two organizations conferred on the problem and the N.I.C.D. conducted a series of tests on sample buttons of various types.

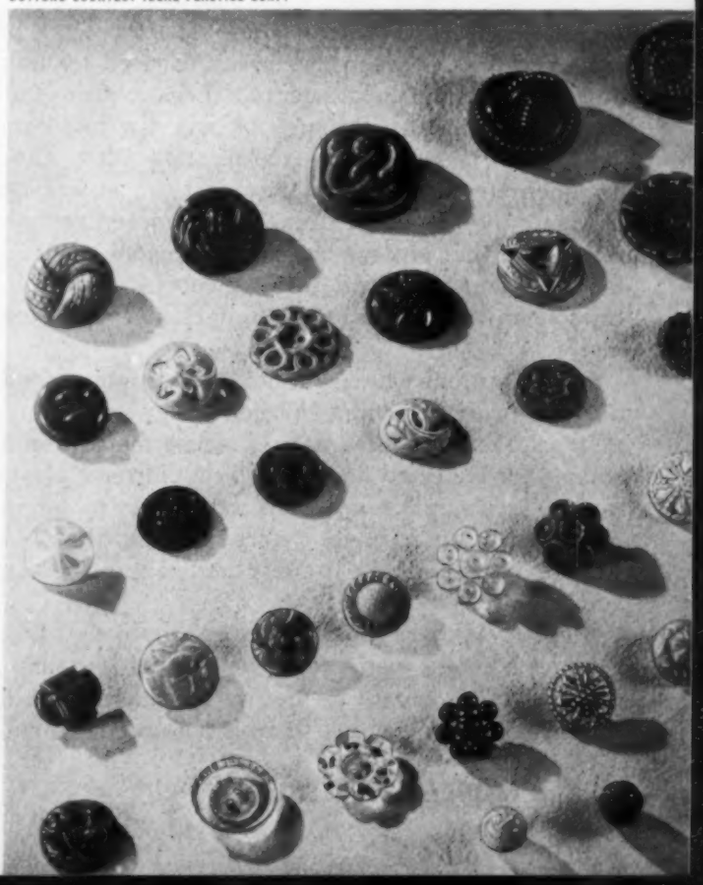
The final conclusion, announced in N.I.C.D. Technical Bulletin T-189 (dated November 15, 1947), was that "most all of the dry cleaning industry's troubles with buttons which dissolve or soften in

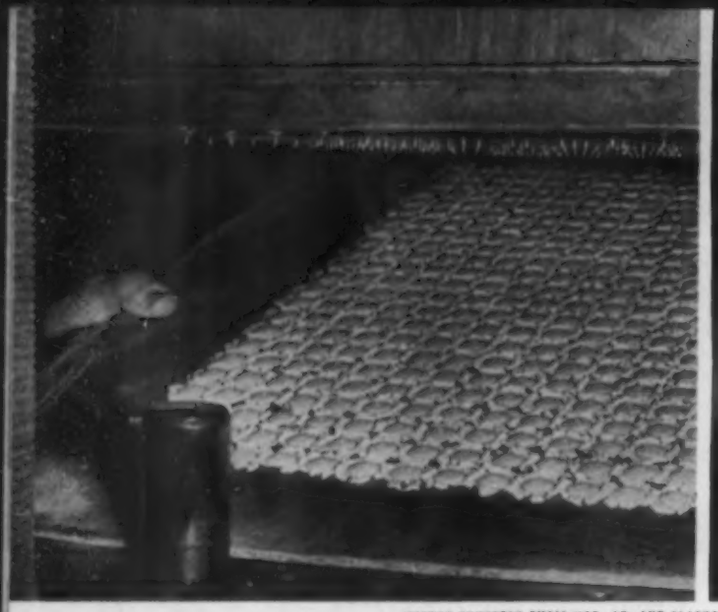
COLOR PLATES COURTESY EMSIG MFG. CO.

Thermosetting buttons, comparatively simple in design, are used on wash dresses, men's suits, shirts, sweaters, etc.

Thermoplastic molded buttons are usually decorative. Designs are elaborate, often call for numerous cut-throughs

BUTTONS COURTESY IDEAL PLASTICS CORP.





PHOTOS COURTESY EMSIG MFG. CO. AND PLASKON DIV., LIBBEY-OWENS-FORD GLASS CO.

Urea buttons being removed from the mold. Compression molds for buttons usually have many cavities, rarely use ejector pins. Buttons are sometimes blown out of die with air hose

Compression molded buttons before and after burring operation. Holes for thread are not always molded all the way through; thin wall sections which close holes are removed by tumbling

dry cleaning have been caused by buttons of the plastic known as polystyrene." Melamine, urea, phenolic, and casin, the N.I.C.D. reported, "have no tendency to soften or dissolve in dry cleaning."

Button manufacturers represented on the S.P.I. committee then agreed to stop making opaque polystyrene buttons and to use the material only for the manufacture of clear, glass-like buttons. N.I.C.D. members were to be advised to remove transparent polystyrene buttons from garments before cleaning. An informative card was prepared and distributed to help cleaners recognize polystyrene buttons.

Controversy continues

Despite this agreement, there continues to be some controversy over the materials used to mold buttons. Some manufacturers of thermosetting buttons maintain that the use of any thermoplastic material to make buttons is a misapplication. Their argument (colorfully put forward in the advertising of one large manufacturer of thermosetting materials), is that buttons are likely to come into contact with hot irons and that thermoplastics are incapable of withstanding such contact without softening.

Plastic buttons which will not stand ironing or will dissolve in dry cleaning solutions, they argue, give all plastic buttons a bad name because the consumer cannot be expected to distinguish between plastic materials. To make a button which has to be removed from the garment before cleaning, they contend, is like making a tumbler and telling the consumer not to put water in it.

Molders of thermoplastic buttons reply that their product meets a demand for decorative buttons—a demand which cannot be met by thermosetting buttons. They point out that there is nothing new about buttons which have to be removed from garments before cleaning; glass buttons, which have been made for years, would break and tear the garment if they were not removed. The solution, they maintain, is informative labelling—and the card distributed by the N.I.C.D. is a step in the right direction.

One manufacturer of thermosetting buttons, who considers the S.P.I.—N.I.C.D. agreement only a temporary stop-gap, is working on his own solution to the problem: a transparent thermosetting material for molding buttons.

It is interesting to note, in connection with this controversy, that over 25% of the thermoplastic buttons molded reach the consumer as metal-plated plastic buttons. These combine the appearance of metal with light weight and more intricate design than could possibly be imparted to metal buttons at comparable cost. And plated buttons (regardless of the base material) will withstand solvents as well as metal buttons.

Production problems

Broadly speaking, most of the problems involved in the production of plastic buttons are substantially the same as those involved in molding any other plastic products. The most important differences arise from the size of the product and the tremendous number of units which must be handled in any production run. Unlike most molded items, which are measured by the number of units, buttons are usually counted by the gross. And even this unit is not large enough for convenient handling of smaller buttons. They are measured by a unit which is rarely used outside the button business—the "great gross" (12 gross). Their size is measured by "ligne". A 40-ligne button is 1 in. in diameter.

Buttons furnish excellent proof that correct de-

PHOTO COURTESY LIDZ BROTHERS, INC.

Inspecting buttons is an important part of the production process. A plugged thread hole can break the needle in a garment manufacturer's sewing machine. Color must also be checked

sign of a plastic item is important no matter how simple the product. At first glance there would seem to be only one way to make a simple two-hole round button with a convex face and a lip around the edge. But a slight difference in design can mean the difference between a button which will break under 75-lb. pressure and one made of the same material which will withstand more than 1200 pounds. This is done simply by curving the face of the button so that any pressure applied to it is evenly distributed instead of being concentrated on the edges. Despite the great difference in strength, the curved button and the one which it replaced present virtually the same appearance. This improved design was originated by the Emsig Mfg. Co., New York, N. Y.

Special problems

In addition to the problems which are common to all manufacturers of plastics products, button makers have additional problems which are peculiar to the button business.

Those who make buttons for women's wear must keep up with changing fashions. Although virtually all types and colors of buttons are used every season, there are fashion trends which have an important effect upon the volume of each type of button which can be marketed. Manufacturers must be able to guess long in advance whether the fashion for a particular season will call for many buttons per garment or few, for elaborate buttons or simple ones, for metal buttons (including metal-plated) or plastic, and so on.

Manufacturers of buttons for the men's clothing industry also have problems which are unlike those usually encountered by plastic molders. Perhaps the most important is the constant problem of color matching. This is complicated by the fact that buttons for men's suits or coats are ordered in two sizes, which must match exactly. Thus it is necessary to use machines which make two sizes of preforms simultaneously from one lot of molding powder.

Most of the buttons used on men's suits and coats are mottled buttons. The mottle is stencilled onto the preform before molding and there are unavoidable variations in the color of the finished button. The variations are hardly noticeable to an untrained eye—but clothing manufacturers insist on closer matching. Thus the buttons must be "shaded."

The following method of shading is used by the Rochester Button Co., Rochester, N. Y., one of the largest manufacturers of buttons for the men's clothing industry:

Buttons are first divided into "casts"; a lot of mottled gray buttons, for example, may be divided into those with a blue cast, those with a pink cast, those with a white cast, etc. A lot of buttons will usually yield three or four casts.

Each cast is then divided into shades (i.e. light, medium, and dark and, if the shader sees enough variation, very light and very dark). Thus each lot of buttons will be divided into somewhere between 12 and 20 different groups.

This work is done by highly trained operators, using only natural north light. The importance of this operation is indicated by the fact that one-fifth of the company's personnel is engaged in shading and inspecting buttons. The company finds it necessary to stock over 10,000 patterns, colors, and sizes of buttons.

It is obvious that only a large corporation could possibly stock so many numbers and be prepared to deliver any item in any reasonable quantity on short notice. This is only one of many reasons why button manufacturing, if it is to be done successfully, must be done on a large scale.

A molder can make some egg cups without "going into the cup business," or mold some coat hangers without "going into the hanger business." But buttons are different. To make and sell buttons successfully, one must go into the button business—and that means one must know a lot about the garment business, the notion and novelties business, fashion trends, and color tolerances in addition to knowing how to mold small items in large quantity.

A button is indeed a little thing—but buttons are really big business.

Acknowledgements

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Ready-to-Cast Compound

Supplementing cast plastics in certain applications, this new composition may also be used in dies for embossing acrylic and copper

by JOHN DELMONTE*

ROOM temperature setting qualities, extremely low shrinkage, colorability, and a favorable price range are the advantages claimed for a new casting composition. Developers claim that the new composition, called Calcerite, promises to augment the field of cast plastics, rather than to add another material to a highly competitive picture.

Initial efforts in the development of Calcerite were undertaken at the Plastics Industries Technical Institute in 1941 and 1942, with a moderate degree of success during the latter part of 1942. Some of the castings prepared at that time still demonstrate remarkable durability and excellent appearance. The work was shelved during the war because of the exigency of other research problems and the unavailability of certain critical materials. At the end of the war, the work was resumed at Furane Plastics and Chemicals Co., Los Angeles, Calif.

A satisfactory product with commercial possibilities was evolved there and a limited production program has been in progress for over a year. The material is now commercially available from the Furane Co.

Properties of the new compound

The exact composition of Calcerite cannot be disclosed at this time. The material is furnished as a ready-mixed dry powder compound, formulated from blends of certain amino-aldehydes and several fillers, most important of which is the hemi-hydrate of calcium sulfate. In arriving at optimum results, a great many fillers and binders have been evaluated, including most of the commercial latices and thermosetting resins, as well as organic and inorganic fillers. Because the high peak physical properties depend upon the particular combinations used, Calcerite was developed to be immedately ready for casting, without requiring any further compounding by the plastics fabricator.

One of the first questions which arises in connection with the new composition is the manner in which its properties differ from liquid phenolic casting resins. The two materials are compared in Table I.

There are certain physical aspects of the setting of Calcerite which can be best understood by examination of the changes which occur during cure. One of these characteristics is shrinkage. When the material is cast in a non-yielding mold, such as a rigid metal mold, no expansion takes place and about 0.001 in. per in. shrinkage may occur at full cure. On the other hand, in a relatively flexible mold, such as the type prepared from a vinyl elastomer, a slight expansion occurs at first, followed by shrinkage to close to original dimensions. This change can be followed by examining the curve in Fig. 1. The data are plotted in so as to reveal the changes which occur, but it should be borne in mind that these changes are small in magnitude as compared with the usual phenolic casting resin.

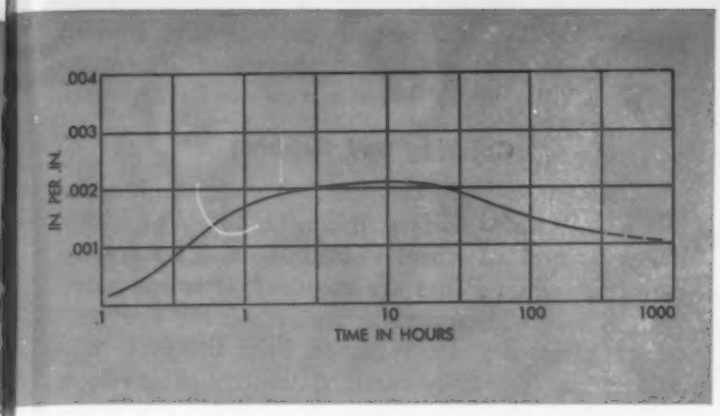
From the standpoint of tooling and duplicating dies, the stability of Calcerite has been deemed an advantage, particularly when one considers the continuing after-shrinkage of phenolic tooling compositions which causes considerable difficulty. Of course, the phenolic can be reinforced with asbestos fillers, and the shrinkage reduced to a smaller amount than indicated in the table; but the performance is still not as good as that of Calcerite.

Flexural strength

The optimum cure strength and cure period are functions of the thickness of the section being cured; thicker pieces require a longer time. Outside surface hardness develops quite rapidly, but properties such as flexural strength have been selected for evaluating cure properties as a function of time. Figure 2 shows typical data for two thicknesses, a 3/16-in. section and a ⅜-in. section taken from test bar molds of the correct size, into which the composition was cast. Though 5000 p.s.i. is indicated as the maximum flexural strength, there are conditions of optimum cure under which appreciably higher strengths were achieved.

To indicate some of the processing variables, ultimate flexural strengths are plotted in Fig. 3 as functions of water content added as an activator. Less liquid than shown can be used, though usually

*Technical director, Plastics Industries Technical Institute.



1—When cast in flexible mold, compound expands slightly at first, then shrinks to close to original dimensions

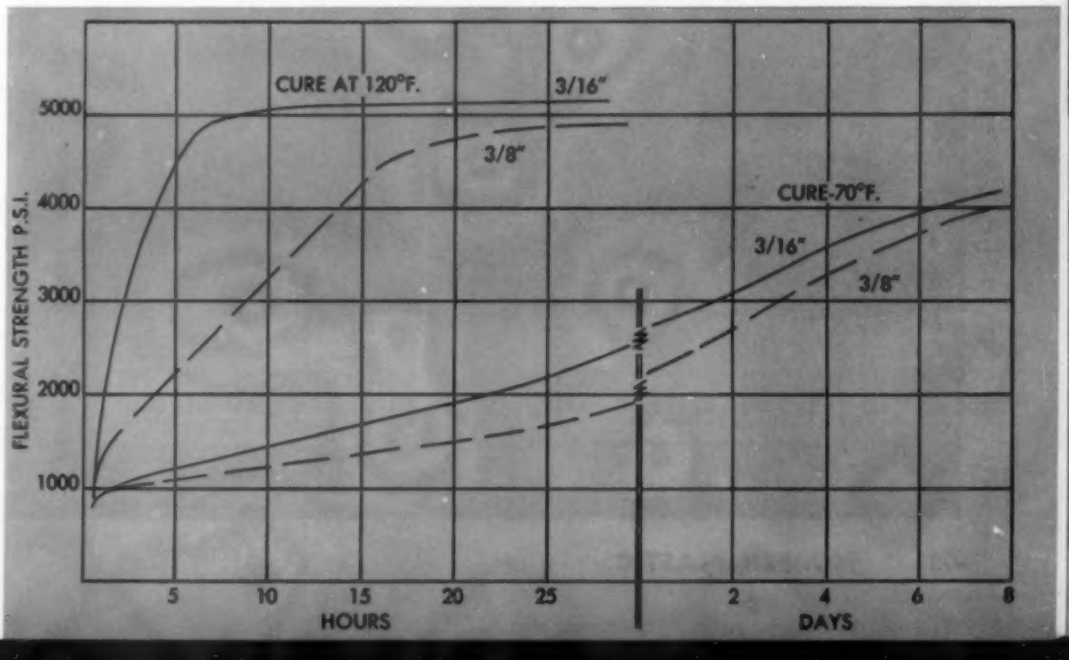
at a sacrifice of pourability. Production experience points to the desirability of wide open molds without a small confined opening, inasmuch as the composition thickens rapidly and must be poured before setting. A good practice is to make a preliminary pour and spread the composition about the mold details with the fingers, and then follow with the balance of the pour to develop the desired bulk and weight.

Setting time may either be increased or retarded by the addition of specific chemical agents to the liquid in which the composition is mixed. There is no critical dependence upon the order in which the water and composition are mixed. However, when they are brought together in the recommended proportions, vigorous stirring or a short motor driven stir are highly desirable to attain the desired fluidity.

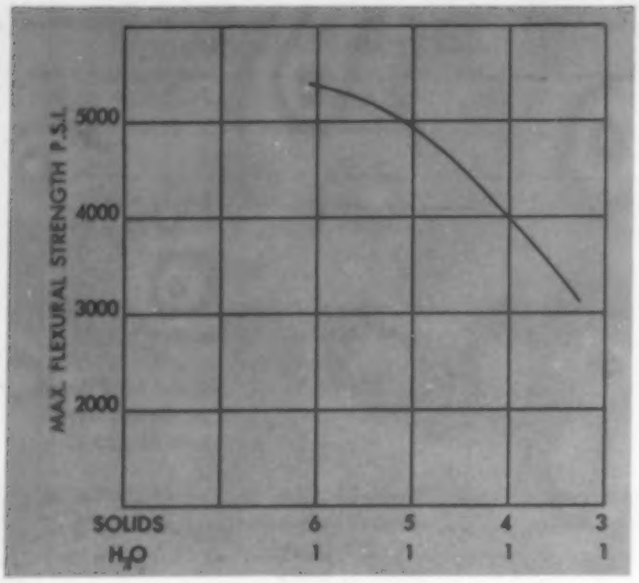
As can be said for other plastic compositions, the impact strength of Calcerite depends a good deal upon its cross-section and the employment of well rounded edges and corners. However, this particular composition sets under pH conditions which are not unfavorable to the inclusion of finely divided cotton flock or fabric fillers. The impact strength in the

Table I.—Comparison of the Properties of Calcerite and a Liquid Phenolic Casting Resin

	Fast setting, acid catalyzed phenolic casting resin	*Calcerite casting composition*
Appearance when furnished	Viscous liquid and catalyst in separate containers	Ready mixed finely divided powder
Preparation for casting	Correct proportion of catalyst slowly stirred into resin	Small amount of water, which chemically combines with ingredients, readies mix for pouring
Retention of liquid consistency	From 10 min. to several hours depending upon make of resin	Several minutes
How cured	By heating from 1 to several hours at 150-170° F.	At room temperature or slightly elevated.
When piece may be removed from mold	When piece assumes firm, solid consistency, near end of cure	When piece assumes firm, solid consistency, usually 30 to 40 min.
Ultimate compressive strength	12,000-15,000 p.s.i.	12,000-15,000 p.s.i.
Flexural strength p.s.i.	4,000-8,000 p.s.i. (differs with makes of resin)	5,000 p.s.i.
Specific gravity	1.34	1.65
Barco hardness	40-50	50-55
Color selection	Limited	Unlimited
Shrinkage	0.004-0.010 in./in.	0-0.001 in./in.
Price	55-85¢ per lb.	40-50¢ per lb.



2—Flexural strength is plotted against cure period for two thicknesses of material cured at 120 and 70° F. Maximum flexural strength indicated is 5000 p.s.i., but appreciably higher flexural strengths have been achieved under conditions of optimum cure



3—Ultimate flexural strengths are plotted against water content. Use of less liquid than shown reduces pourability

presence of these fillers is really remarkable and much mechanical abuse can be absorbed.

There is, however, a certain procedure to follow to realize these benefits. Calcerite is readied for pouring by the addition of a small amount of water, and then the flock is added. The material thickens rapidly, and the composition literally has to be trowelled into position. But when it sets, it leaves little to be desired from the standpoint of toughness. It should be noted that the flock is added to the pourable mix, and not to the dry constituents. If premixed in the latter fashion, the excessive amount of water which would have to be added to prepare for pourability would leave a weakened compound.

Coloring and finishing

As manufactured, this casting compound cures into a dull, white surface. It can be buffed to a high luster on a clean wheel to improve its appearance. However, when colors are required, it is suggested that parts be immersed in water soluble dye concentrates as they are removed from the mold and before they have fully cured. Attractive color effects have been achieved in this manner, and it is actually more than a surface effect because the dye penetrates into the partly cured composition.

For permanent color effects to withstand exposure to outside sunlight, various earth colors can be incorporated into the composition before mixing. In fact, it is possible to duplicate the grains of natural stone and to get color effects and mottles which open unlimited possibilities. Rather than arbitrarily select a few limited colors as standards, the company has decided to make available all necessary information for coloring Calcerite and leave it to the caster to select color combinations best adapted to his production.

Hardened steel tools and bits are preferred for cutting and machining Calcerite. Dry cutting is recommended without the presence of cutting fluids. The composition is more abrasive upon tools than are cast phenolics, though not to an untoward degree. Parts can be sanded readily and given a high luster by conventional polishing techniques.

Calcerite can be used for many applications which

4—White calcerite die at left was formed by casting over sculptured plaque. Copper impression at right was made with the die. Pressure of about 1500 p.s.i. is used to make the impression on copper sheeting

5—Embossed acrylic sheets in foreground were made with Calcerite dies shown behind them. Acrylic material is heated to its softening temperature, then pressed against relatively cold die. Pressure of 500 p.s.i. is applied through rubber pad

are more or less standard for cast plastics. Among the possibilities are cast bibelots, lamp bases, industrial tools and patterns, dental forms, etc.

Articles cast five years ago demonstrate the normal stability which can be expected of these compositions, but more ambitious efforts are now under way to establish weather-resistant compositions. The manufacturers are not ready as yet to recommend the material for this type of exposure, though there is sufficient evidence to encourage optimism.

Exact reproduction on copper, acrylic

More unusual industrial possibilities of the material are illustrated in the accompanying photographs of embossed copper sheeting and embossed acrylic plaques. The pieces were prepared on Calcerite dies, applying the hydropress forming technique developed by the aircraft industry. Figure 4 shows a white Calcerite die formed by casting over a sculptured plaque of President Truman, and a copper impression, at the right. The plastic die will not crumble or spall, as might a material of less solid consistency. Figure 5 shows two white Calcerite dies (standing on end) with representative embossings of acrylic sheet lying in front of the dies.

Exact reproduction on copper or acrylic is possible with the embossing technique employed. A suitable Calcerite die is positioned in a hydraulic press and the sheet material placed above the die. Pressure is applied through a thick rubber pad of about 40 to 50 Shore Durometer hardness. Pressures of about 500 p.s.i. are required for heated acrylic plastic sheet and about 1500 p.s.i. for copper pieces.

An important advantage of Calcerite dies is their low cost, which makes it economically practical for the fabricator to prepare pieces with a large selection of designs. Usually tooling costs restrict production to a few standardized designs.

When making Calcerite dies, the fabricator can prepare a design in a proprietary oil or water base clay, and can cast and cure directly upon this clay. This is a one-step operation, permitting immediate utilization of the die which has been formed. A die made of the usual casting phenolics would cure with a softened surface where it made contact with clay and lose most of the details. Calcerite is not affected by the clay. In addition, wire lath reinforcing, which must be excluded in the case of acid catalyzed phenolics castings, can be inserted to stiffen and strengthen the Calcerite castings. This makes them quite satisfactory for long production runs.

In pressing thermoplastic sheet, it is necessary to bring the material to the temperature where it softens and then, while still hot, press it against the relatively cold die. The die will chill the sheet sufficiently to permit its removal within a few minutes. In the course of a production run, it would be necessary to provide means of cooling the die or a cooling period.

The problems posed by copper embossing are even less severe than those encountered in embossing acrylic. The amount of pressure and the rate of applying this pressure are determined in part by the depth of draw and the thickness of the copper stock. However, unlike acrylic embossing, no heating is required and the production rate per die is more rapid. Finished pieces resemble expensive hand-tooled copper plaques. Thus plastic dies will make an interesting and decorative art available to a large market at nominal cost.

Plastics Win in Fence Controller

Transparent cellulose acetate butyrate housing improves appearance of unit which outsells metal version three to one

NO. 30C COLOR PLATES COURTESY ELECTRO-LINE PRODUCTS CORP.

Combination model fence controller works indoors on 110-volt alternating current or outdoors on 6-volt battery

AN outstanding example of the manner in which a single plastic part can spur the sales of a product is offered by the experience of the Electro-Line Products Corp., Milwaukee, Wis. The plastic part involved is a transparent cellulose acetate butyrate top on the pressed steel cabinet of an electric fence controller.

Butyrate replaces steel

Electro-Line manufactures various types of equipment used with electric fences, a style of fence which is steadily growing in popularity among American farmers. One of the main parts of the company's line is its range of devices which control the current in the fence.

For many years, the company used pressed steel housings for its controllers. The metal did the job of protecting the mechanism, but it also hid the moving parts from view. Electro-Line thought that sales would be helped if the interior mechanism were visible. This would add to the appeal of the device and also enable the farmer to see whether the controller was operating properly by watching the moving parts.

Butyrate was chosen as a material for the new housing. The material was selected for its high impact strength and its ability to withstand sunlight and outdoor exposure. The plastic housing is molded in a single-cavity die by Milwaukee Plastics, Inc., Milwaukee, Wis. The material is supplied by the Tennessee Eastman Corp.

Customers choose plastic

The enthusiasm which jobbers and customers showed for the transparent plastic part surprised the company at first. The standard metal housing was retained as a part of the company's line and customers were given a choice between the metal and butyrate housings. The plastic has consistently outsold the metal by a ratio of three to one.

Controller shown above is designed for use with permanent indoor installation, uses 110-volt alternating current

The manufacturer has polled its 350 jobbers several times to discover their preferences. The jobbers almost unanimously replied that the transparent plastic top was an important selling point. They gave the better general appearance of the controller as one reason.

In addition, many of them said that prospective customers were more impressed by the product when they could see the fine workmanship of the motor mechanism. This feature is not visible when an opaque metal housing is used.

Scrap Filaments in Air Filters

Two waste products, vinylidene chloride monofilaments and metal, form an efficient filter

PHOTO COURTESY MASTER PRODUCTS CO., INC.

Completed 20 by 20-in. air filter has a fiberboard frame with perforated metal sheets on each side to hold the vinylidene chloride monofilaments. Metal staples hold the frame

ONE operation which every industry strives to make profitable is the utilization of waste material. When a use can be found for waste, it spells good business and opens new markets. Master Products Co., Inc., of Chicago, Ill., has developed one such outlet through the development of an air filter which uses scrap vinylidene chloride monofilaments and perforated sheet metal from which bottle caps have been punched. The finished product has unique operating characteristics and special merchandising features, provides efficient filtering, and competes in price with other high quality filters.

This new market outlet for the vinyl filaments was conceived by T. W. Harrigan, president of Master Products, in cooperation with the marketing research department of The Visking Corp., which extrudes the Viskord monofilament of Dow Chemical Co. vinylidene chloride resin at its Terre Haute, Ind., plant. The standard grade Viskord material is processed into such end products as woven textiles, insect screen cloth, and filter cloth.

For such uses, the filaments must conform to exacting gage standards. In the extrusion process, they are gaged automatically, and those filament lengths failing to meet the standards are rejected, falling into the classification of waste or scrap material.

Reprocessing difficult

Unlike many types of thermoplastic materials, vinylidene chloride does not lend itself to reprocessing; attempts to re-extrude rejected filaments result in reduction of tensile strength and impair the quality of the filaments. Accordingly, until this new outlet for the scrap material was devised, it was considered more expedient to discard the sub-standard production than to attempt to reprocess it. Even discarding has proved difficult for the material cannot be satisfactorily incinerated.

Monofilaments used in the Plastic Dustrap range in diameter from 0.008 to 0.015 inch. A study of the physical properties of the waste lengths soon indicated their adaptability for filter use. Unlike some materials used in disposable filters, the plastic monofilaments may be handled without fear of cutting the fingers. Its high resistance to burning meant a filter which would not constitute a fire hazard, and investigation showed that the filaments could be

processed for filter use without undue manufacturing difficulties.

In addition, the color range in which the waste material is available made possible the output of air filters having attractive colors. Until now, olive drab has constituted the bulk of the production. It was felt that this point was particularly important in the many instances where "the lady of the house" was able to influence the purchase of filters for replacement use in home heating and air conditioning systems. Also, the variety of colors makes possible attractive store displays of an ordinarily drab item.

Among the materials ordinarily employed in filters of this type are vegetable fibers, glass fiber, and paper. Before beginning production of the plastic filter, the Master Products firm supplied most of its production in tula fiber, the center strand of a large leaf; the filter media varied in their filtering capacity, flame resistance, and other properties.

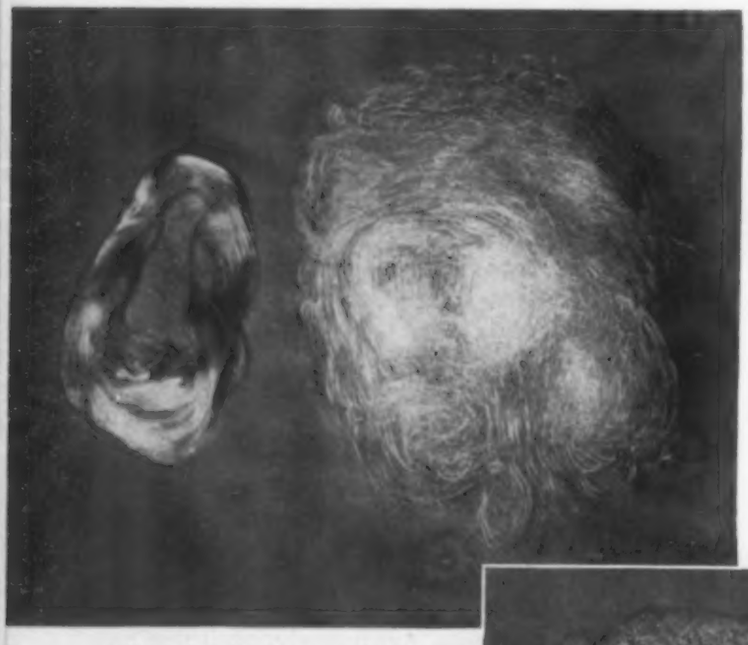
Made in a variety of standard and special sizes, the new disposable filters have a number of applications in the heating, ventilating, and air conditioning field. On forced air furnaces, two or more filters are placed in the filter box, where a fan draws air into the intake side of the system. Here the filters screen out dust, fuzz, soot, and other foreign matter before the air passes on into the system to be heated and circulated. Usually, this type of filter is replaced twice during the heating season.

The filters are also widely used in air conditioning installations. Small "package" air conditioning units may incorporate six to eight filters, while a large store or factory installation may employ several hundred filters in its complete installation. Fifty or more filters are not uncommon for a typical theater air conditioning installation. Other filters find their way into window ventilation units and other air circulation devices in which air must be cleaned prior to circulation. The total market for replacement filters is estimated at from six to eight million units annually.

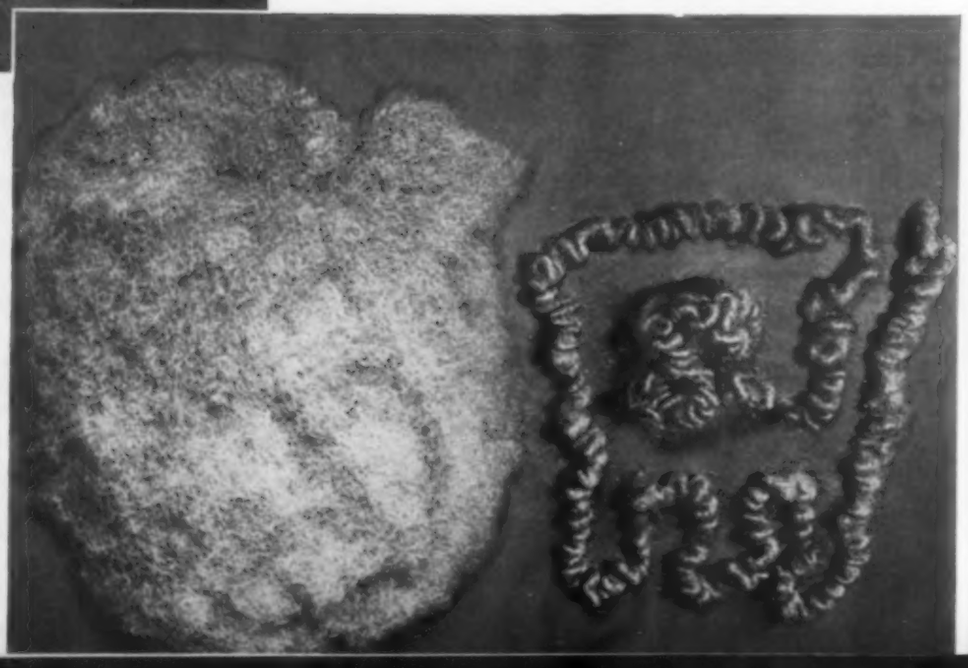
Filaments are curled

The Plastic Dustrap air filter is unique in construction as well as in material. It is so designed that it combines curled Viskord filaments on the intake side of the unit and uncurled filaments on the exhaust side, providing a differential filtering action and increasing over-all efficiency. Most filters employ a uniform density all the way through and tend to "load up" on the intake side so that filtering efficiency is rapidly impaired.

As explained by Mr. Harrigan, use of the curled filaments on the intake side gives the unit a low initial filtering action and permits much of the foreign material to penetrate more deeply into the filter before being stopped. Most filters are heavily impregnated with grease on the intake side but the Dustrap filter is dry. Instead, the center divider of the filter is sprayed with oil and the heavier pack of the straight fibers on the exhaust side screens out dust that seeps through this center oil surface. This lengthens the life of the filter for, by tapping slightly, most of the dust on the intake side releases.



After untangling, scrap material appears as at left. It is then fluffed, at right, prior to being packed on exhaust side of filter



Monofilaments at right have been twisted into rope-like strands and subjected to a heat operation to set the curl. They are then cut into 10 to 12-in. lengths and run through a picking machine to produce the fluffy material at left. These go on intake side of filter

Material is being weighed by operator in foreground. Eight ounces of curled material and 12 oz. of uncurled material go into each filter. Another operator, at the right, is packing the pre-weighed filaments into the frames

Before the vinyl filaments can be used in filter construction, several preliminary steps are required. The scrap Viskord material comes to the Master Products plant in fiber shipping drums, separated by colors. Matted together, the filaments may range in length from 40 to 100 feet. Prior to actual incorporation in the filters, the material must be "unsnarled," cut into convenient lengths, and some of it given a curl.

Curling is accomplished by means of a process which involves twisting filaments into rope-like strands, followed by a heat treatment at a maximum temperature of 275° to set the curl. Cut into convenient lengths, the material is then put through a picking machine which fluffs it out to the required density. The uncurled material used on the exhaust side of the unit is also run through the picking machine prior to its incorporation in the filter.

Assembly of filter

Construction of the actual filter involves packing the processed material into a fiberboard frame or edging carton, with perforated metal plates on each face of the unit to keep the material in place and a similar plate sandwiched in the center to divide the curled and uncurled filaments. The frame, reinforced by metal strips as shown in accompanying photos, is stapled together on a metal stitching machine.

A 20 by 20-in. filter requires about 8 oz. of curled material and 12 oz. of uncurled; other filter sizes take a proportionate amount of material. After stapling the first perforated metal sheet in position, the weighed amount of flat material is packed into the frame and the center metal divider placed in position.

After the straight and curled filaments are inserted, an operator completes unit by stapling the frames together

The center divider is sprayed with a light weight filter oil having a high flash point and the 8 oz. of curled filaments are then placed in position, forming a sandwich pad. Finally, the two frames are brought together and stapled around the edge at several points, producing a firm finished assembly.

Olde King Cole's fiddlers wear acetate skirts, hats, cuffs, and acetate-spangled bodices. Their fiddles are acrylic. Hats are sprayed on inside with pink and black paint. Skater in center wears long black acetate skirt. Unlike cloth skirts, which take hours to dry when they get wet on the rink, plastic skirts can be packed away wet when the show has to move immediately after its last performance in a city. They never need washing

PLASTICS ON ICE

IN SHOW business, as in many other businesses, there are jobs which plastics can do better than other materials. A glittering example is the "Ice Follies of 1948," produced by The Shipstads & Johnson.

In the current version of the 12-year-old show,[1] many of the costumes, scenery, and props are plastic. The materials used include acrylic, cellulose acetate, cellulose acetate butyrate, and Plyon—a laminate of Fiberglas impregnated with a polyester resin.

The producers like plastics because they are attractive in appearance, light in weight, water-resistant, can withstand low temperatures, and are easy to keep clean.

The applications of acetate include skirts, hats, a throne for "Olde King Cole," and a pony-drawn

[1]See also "Acrylic and acetate in the Ice Follies," MODERN PLASTICS 23, 124-125 (June 1946).

Above—"Bang board" around rink is made of polyester laminate. It is made in 6-ft. and 2-ft. sections so that it can be fitted around rinks of different sizes and shapes in the 17 cities the show plays. The light weight of the material simplifies transportation problems, an important consideration to a company which travels 25,000 miles a year with five boxcars of equipment. Right—Pony-drawn coach has cellulose acetate body, sprayed on inside with pink and black paint. Even tassels are formed of acetate. Skaters in coach are visible and attractive highlights result when spotlights hit glossy surfaces of coach

Left—Fluted two-piece acetate skirts are paint-sprayed on inside to give them a frosted effect. Bottom pieces of all skirts shown can be stored or transported in same space as a single skirt because skirts nest inside one another. Hats are also acetate

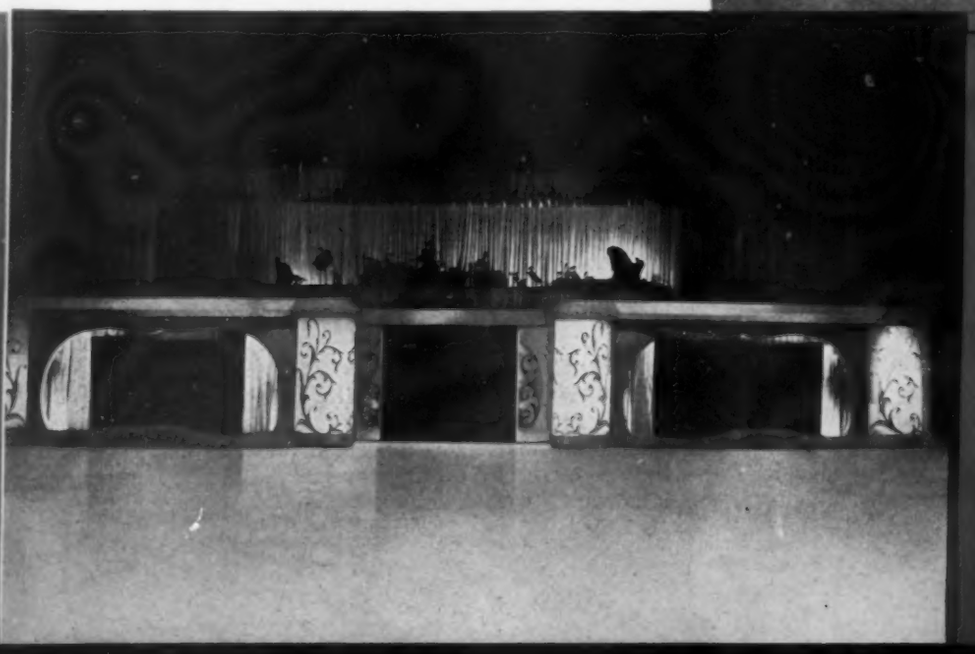
Below—Bases of flowered props are fabricated of low pressure laminate containing two plies of glass cloth impregnated with clear polyester resin. Leaves are dark green translucent cellulose acetate. Spangles on skater's costumes are also acetate

coach—all made of Lumarith in the Ice Follies' own costume shop. The spangles used on all costumes throughout the show are Plastar Spangles, furnished by Union Novelty Co., New York, N. Y. They are made of a special composition of Tenite, and can be ironed with a warm iron.

The orchestra stand, which also frames the entrance to the rink, is made of translucent white Plyon, supplied by Swedlow Plastics Co., Los Angeles, Calif. The laminate is backlighted to bring out the blue scroll design.

The same material is used for the "bang board," the low guard rail which surrounds the rink. The Plyon is tough enough to withstand the impact of skater's bodies or the sharp edges of skates without breaking. But it is resilient enough to avoid injury to skaters who fall against it.

The 1949 show, according to producer Eddie Shipstad, will use even more plastics than the present version.



Left—Orchestra stand is made of same laminate as "bang-board," and similar blue scroll design is stencilled on. For some parts of show, orchestra stand and bang-board are back-lighted while rest of house is darkened. Same material is also used for Olde King Cole's large pipe and bowl, 6-ft. thimbles, lamp-posts, and various other props in the show

Canadian Convention of S. P. I.

Merchandising of plastics and plastic products was the major point of interest at the Sixth Annual Convention of the Canadian Section of the Society of the Plastics Industry, Inc., held in the Mount Royal Hotel, Montreal, Canada, on February 16th and 17th. Approximately 300 delegates attended, and the industry in the United States was well represented. General Conference Chairman was L. C. McLoed, Monsanto (Canada) Ltd. The accompanying digests of the papers presented at the convention highlight the thinking of the speakers.

CHAIRMAN of the opening session of the Canadian Section of the S.P.I. Convention was S. Levites, Duplast Ltd., replacing A. C. McCoy, Barringham Rubber & Plastics Ltd.

New horizons

Opening speaker at the convention was Walter N. Finney, molding powder supervisor, American Cyanamid Co. The subject of his address was "New Horizons for Plastics."

The previous emphasis within the plastics industry has been on engineering and manufacturers' technological developments, rather than on sales and sales promotion. In the past, in view of the newness and novelty of the plastics industry, the initiative for the selling of plastics has been on the buyer. This initiative must be taken away from him. All of the component parts of our industry should most certainly be concerned with the need of furthering application development. We should all gear ourselves up to press this point, and be prepared to expand our efforts along these lines.

The program for expanding these efforts should most certainly include continued technical efforts on the part of all factions within the industry. It is urged that we do everything possible to get this technical effort on a more thorough cooperative basis than it has ever been before, so that future technical developments within one part of our industry will be kept pace with by developments within other parts of the industry. Significant progress has already been made along these lines. The development of high frequency and plunger molding, along with the development of faster curing Beetle urea materials, has been a move in the right direction. These developments have already indicated the need for equipment development to keep pace with these efforts.

Certainly, these technical development efforts should continue, but, along with the continuation of these efforts, we should put greater stress on our sales and promotional efforts. We must broaden our sales personnel to do more of this type of work. We must be willing to work hand in hand with end-users in the development of applications. Examples of such work is that done in the development of the tableware and tree guard market with melamine and work done by the polystyrene and thermoplastic industries in the development of the wall tile and toilet seat markets. This type of effort, both individual and cooperative, should certainly be continued and expanded.

In packaging

William F. Cullom, director of sales, Transparent Films Div., Celanese Corp. of America, spoke on "Plastics in Packaging".

Plastics enjoy a very small percentage of the packaging dollar, somewhere in the neighborhood of 10% of total plastic production going into this field. However, with the advent of new materials and combinations of new and old materials, new fabrication techniques, sales promotion ideas, and the growing importance of packaging, this percentage is increasing rapidly.

Phenolics, ureas, and cast phenolics offer new designs daily in boxes, plain closures, closures incorporating measuring devices, etc. Some of the newer packages molded from thermosetting materials are very large, such as a urea silver chest measuring 12 by 18 by 5 inches.

Neither molded nor fabricated acrylic is new to packaging, but here again there is a trend toward large packages such as International Silver Co.'s new formed acrylic box 11½ by 9½ by 5½ inches. Plastics add distinction to such large packages.

The vinyls continue to grow in use in packaging. Among the newer uses are vinyl bags for the shipment of vinyl butyral, vinyl as a liner for some multi-wall bags (the plastic is cast on the paper prior to fabrication), vinyl for can linings and as the means of heat sealing metal foil packages. The new Armour & Co. flexible package is transparent, beautifully printed, and holds a vacuum. Combinations of Pliofilm and cellophane, Pliofilm and cellulose acetate, and others have astounding properties of strength, aging characteristics, dimensional stability, and low moisture vapor permeability coupled with excellent oxygen and carbon dioxide transmission rates. Variations are possible whereby moisture vapor and gas transmission rates can be controlled almost at will. These combinations are important in packaging such materials as fresh frozen foods, but are still quite expensive.

Cottage cheese is now being sold in molded polystyrene containers which may be used as ice box dishes when the initial product has been consumed. This cheese, since it contains lactic acid, is easily contaminated, and polystyrene has proven very satisfactory. It is important in applying plastics to packaging to test thoroughly since essential oils can affect some materials and one material can affect another when in close proximity.

Polyethylene is big news in packaging, for squeezable, unbreakable bottles, closures which require no liners, and films for various applications. Screw-type polyethylene closures are about equal in cost to urea but 50% higher than phenolic. Open types are about 20% cheaper than wood topped cork and cheaper than rubber, and may show progress in the liquor packaging field, since they can be used on automatic closing equipment.

Modern equipment is available to seal electronically almost any plastic to itself and in many instances to some other material. Proper control of temperature, and the use of special coatings on metals for the heaters are important.

Transparent packaging is related to self service, which is a trend to modern merchandising. The Altman hosiery package has increased stocking sales, while cutting industry space and speeding up delivery to selling areas in stores.

Informative labeling

The chairman of the February 16 luncheon was J. F. Armitage, Canadian Industries, Ltd. The session was addressed briefly by George Clarke, president of the Society of the Plastics Industry in the United States, with an announcement of completion of the S.P.I. survey on informative labeling needs and the impending establishment of four committees to develop an informative labeling program for the industry.

Cooperation

James B. Neal, president, Norton Laboratories Inc., presented a paper which was entitled: "Industry Cooperation."

Raw material production in the plastics industry has jumped from a little over 150,000,000 lb. in 1936 to 1,100,000,000 lb. in 1946. This increase in raw material production was accomplished largely by the increase of production facilities by those companies already engaged in the business. From the standpoint of press capacity in the same 10-yr. period, when raw material production increased 7½ times, compression molding pressing increased 7½ times while injection machines increased 33 times. And there have been few new companies in the machinery business.

But the number of companies engaged in the injection molding business in that 10-yr. period increased 27½ times while the number of companies engaged in compression molding increased 6¾ times. The industry thus expands in a horizontal rather than a vertical manner.

One of the great problems of the molding industry is its weak price structure. Regardless of differences in mold capacity, and opinions on cost of finishing, there should not be on one job a variety of quotations from $12 a thousand to $37 a thousand. It is difficult to get yardsticks which might be set up for the purpose of proper quotation, but one indication that should be kept in mind is the over-all ratios of the cost of material per dollar of sales. In short, molded parts are today being sold at from three to five times the cost of materials, with injection molded parts selling at a lower ratio than compression molded parts. And, since the average net profit of molding companies over a period of years has been around 4%, it is unwise to quote less than twice the cost of material.

The experience of better molders seems to be that press equipment should produce the sales volume expected while operating at not over 75% of its total hourly capacity. The stealing of molds is to be deplored. It has long been a practice in the molding industry to sell molds at cost. Yet the cost of tools in a molded job will equal or exceed the sales value of the initial order. Under economic stress, a molder is tempted to approach a potential customer in an endeavor to entice molds from a competitor. This just does not make sense. Anybody who wants more business should get it by developing new business.

Standard conditions of sale should prevail throughout the industry. The SPI has suggested a standard form for contracts on standard conditions of sale. Its general use will prevent much stupid pirating of accounts. In the field of proprietary items, if the other fellow has a good item, leave him alone and try to develop a good item of your own. Cooperation between molders and mutual respect and trust will quite naturally bring about better conditions.

Economic forces

The afternoon session of February 16 was under the chairmanship of George Whyte, Dominion Comb and Novelty Co. The guest speaker was S. W. Fairweather, vice-president of Research & Development, Canadian National Railways. His address on "The Changing Emphasis" was an analysis of the broad underlying economic forces presently at work. Fear has been the motivation of the shift in our economy and its result is a search for security. In this search for security the planned economy comes to the fore. This means economic nationalism, trade barriers, restricted movement of the individual, restricted movement of capital, and the hampering of the exchange of ideas. Every step adds to the expense of government and reduces the average standard of living.

Western economic growth came through the creation of great markets in Europe and the export of capital from Europe; immigration merely proved that labor and capital will move in response to market demands. Europe can no longer afford a healthy market. And with fear a major factor in our economic thinking, the future will call for the utmost cooperation and good will between the various classes of society and between nations if our standard of living is to be improved or even maintained.

Selling plastics

J. H. DuBois, executive engineer, Shaw Insulator Co., selected the title of "Considerations that Sell Plastics" for his talk.

Finding the prospect is the first job. Potential customer lists are developed from studies of classified telephone directories, trade magazines, mail order catalogues, Chamber of Commerce reports, financial reports, and routine calls. Successful salesmen budget a portion of their time for market research and do it regularly.

Enthusiasm is important in conditioning the prospect. The salesman should enter with a determination to arouse so much interest that the customer will call in many other key men in the organization to hear his story. Prospects should be taken to the factory when possible so that they may visualize your procedures and problems. Samples will arouse interest; the prospect will interpret them in terms of his problems.

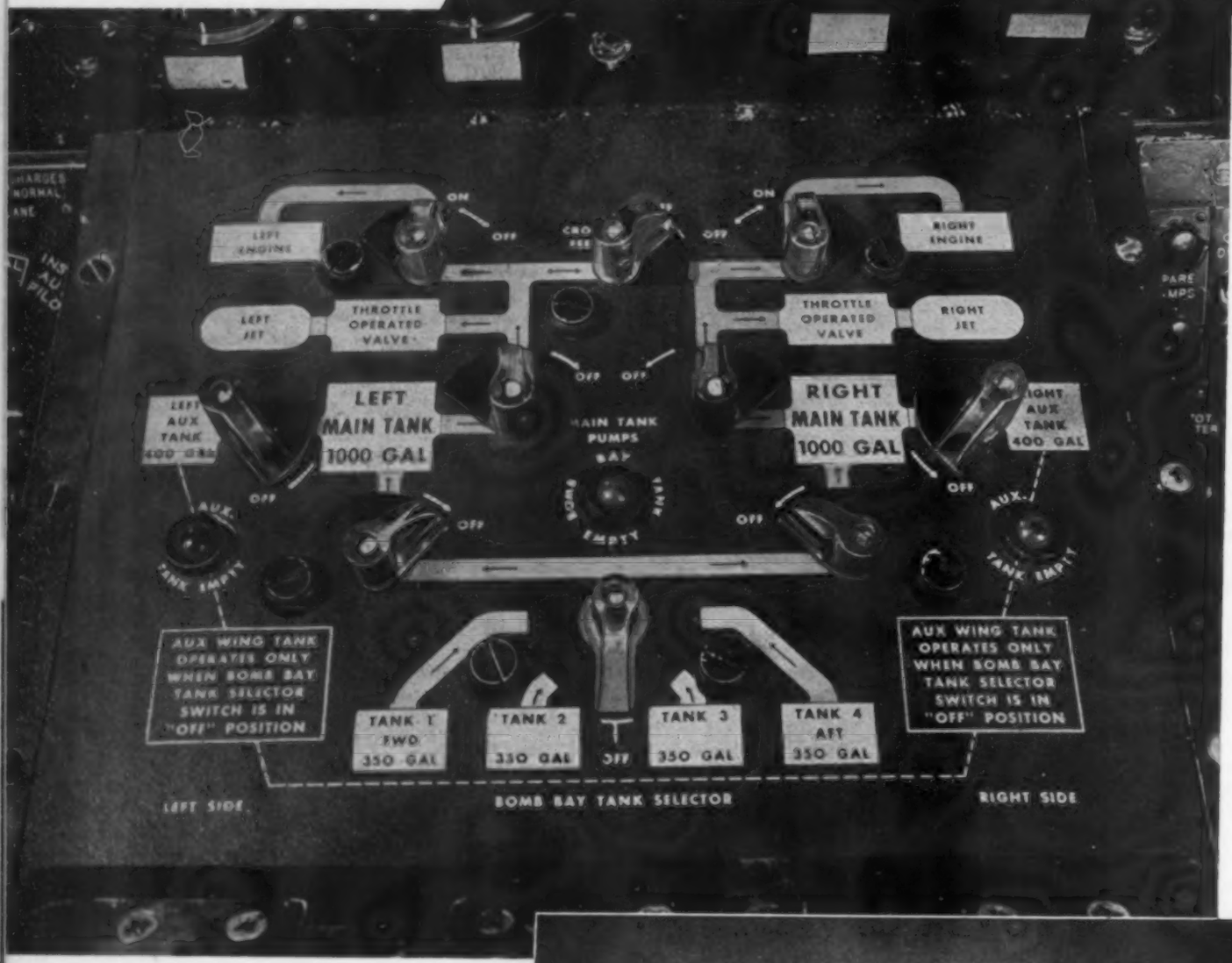
Adequate information concerning the customer's requirements is reflected in the form of good quotations. Full details concerning the application and adequate information are essential to the preparation of a sound quotation with minimum prices. Inquiry blank forms which list the data essential to a carefully prepared quotation are very helpful since they serve as a guide for salesmen and buyer.

No plastic concern can afford to go along with any questionable design or material application. A blunder by anyone of us is a black eye for the entire industry. Engineers must be responsible for the soundness of each application that is quoted on. Engineering considerations will include essential design changes, material selection, tolerances, production methods, insert studies, machine availability, tool and fixture design, manufacturing cycles, inspection, packing, and shipping. Careful planning results in profits. A carelessly made estimate may bring loss of prestige to the entire plastics industry and put you out of business.

The quotation must include all essential details that are included in your price. Your quotation must clarify

(*Please turn to page* 192)

FUEL FLOW



1—Acrylic control panel is also a fuel flow diagram. Illuminated paths show which tanks are turned on. In this picture, the four bomb bay tanks and the left and right auxiliary tanks are shut off. By following unbroken light paths, pilot can tell that left main tank is feeding the two left engines and right main tank is feeding right engines. Crossfeed is shut off

2—Control knob is specially designed so that it does not break the illuminated light path passing under it when the knob is in the "on" position. When the knob is turned "off," the opaque tab hides the light path, showing that fuel is no longer flowing through the valve. Knobs are fabricated from acrylic blanks and tabs are sprayed with cellulose nitrate lacquer

CONTROL PANEL

Edge-lighted acrylic panel shows pilot which of eight fuel tanks are feeding the two jet and two reciprocating engines of new bomber

THE Martin Mercator, a new long range patrol bomber, has four engines (two jet and two reciprocating) which are fed by eight fuel tanks. But the fuel flow controls in the plane are as simple as the fuel system is complicated. The simplicity is achieved with an illuminated acrylic fuel flow diagram which also serves as a control panel. It traces, with illuminated paths, the route traveled by the fuel from any tank to any engine.

The panel, designed for the Mercator by engineers of The Glenn L. Martin Co., is prominently placed in the cockpit just forward of the throttles (Fig. 3) and can be seen clearly by either the pilot or co-pilot.

Construction of panel

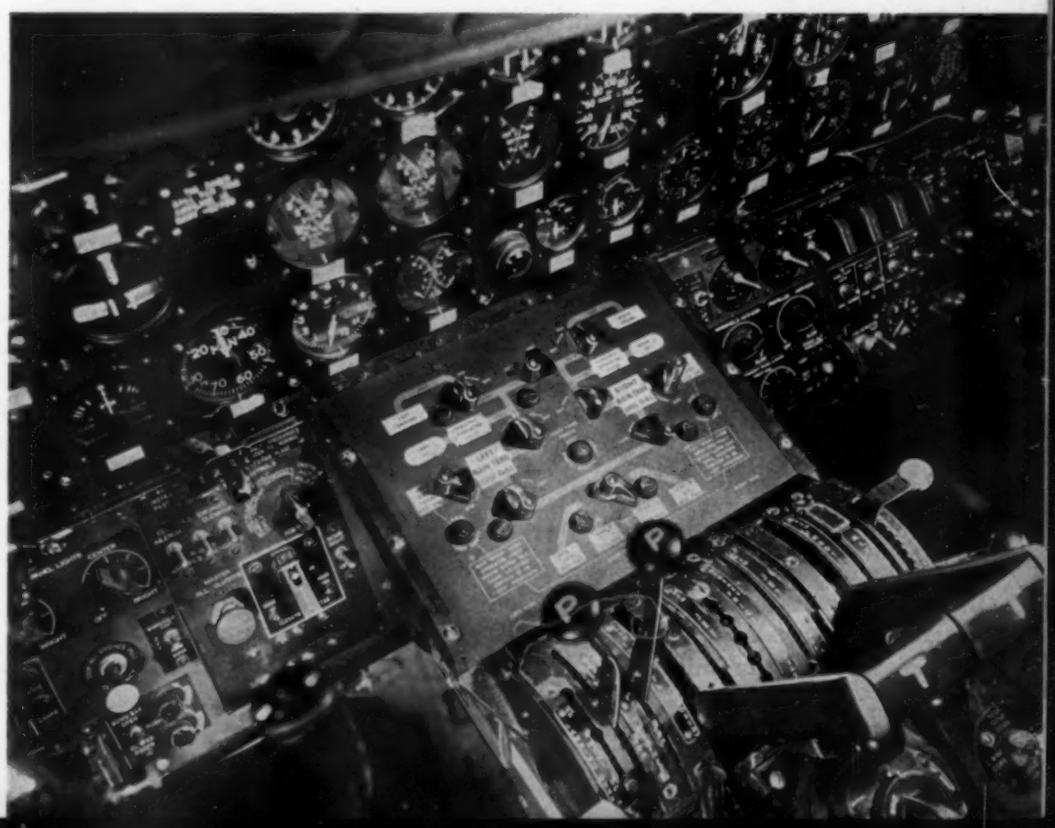
Transparent acrylic sheet 3/16 in. thick was used to make the panel, which is 13 5/16 in. wide and 9¾ in. high. The base was covered with a vinyl decal prepared by the Decal Specialty Co., Philadelphia, Pa. All fuel tanks, engines, and fuel lines were indicated in white on a black background with each item labeled for surer identification. Then the surface was coated with a clear vinyl to obtain a matte finish.

Seven holes were then drilled in the panel to accommodate lighting fixtures. These fixtures, as seen in Fig. 1, resemble screw heads. The "grain of wheat" bulbs project downward below these heads so that the light is piped through the edges of the drilled holes. The fuel diagram thus appears as a lighted path on a dark background. Lettered directions and labels are also illuminated.

Transparent control knobs

Each of the ten control knobs is placed at the point on the fuel flow diagram which corresponds to the location in the actual fuel system of the valve it controls. The control knobs are designed so that the illuminated fuel flow line is visible when the knob is in the "on" position, but is hidden from view when the knob is in the "off" position.

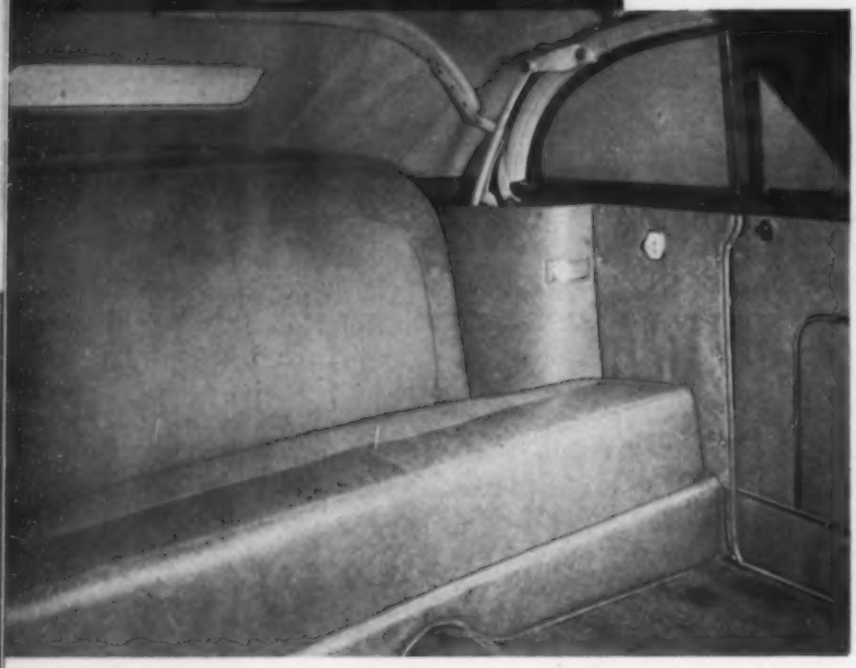
This effect is achieved by the use of transparent Lucite for the knobs (Fig. 2). Each of the knobs (except the bomb bay tank selector valve, which has five positions instead of two) has a fan-like tab which covers the lighted path when the knob is in the "off" position. A black cellulose nitrate lacquer is used to paint both sides of the tabs to make them opaque. The control knobs were handmade by Martin workmen from acrylic blanks.



3—Fuel flow control panel is prominently placed in cockpit of new patrol bomber forward of the throttle quadrant. In this central position, it can be seen easily and can be reached by either pilot or co-pilot. Transparent acrylic sheet 3/16 in. thick was used to make the panel, which is 13 5/16 by 9¾ inches

PLASTICS in 1948 PACKARDS

Steering wheel is injection molded of cellulose acetate butyrate. Horn button in center is molded of acrylic



Upholstery in new Packard Super Convertible is vinyl chloride coated fabric. The windlace, the tube-like stripping around doors, is covered with vinyl chloride

Upholstery of station sedan is woven from saran filaments. Trim is vinyl chloride coated fabric

INDICATIVE of the automotive industry's latest thinking on the use of plastic materials are several applications in the 1948 (22nd Series) Packard line.

First among the nation's automobile manufacturers to unveil its 1948 models, this pioneer manufacturer is retaining a number of plastic applications which are more or less established fixtures in the industry, and has also come up with new uses which may foreshadow an important trend involving a large volume of plastic material.

Upholstery from several sources

Outstanding among the plastic applications in the 1948 Packard line is the company's use, in its new station sedan, of woven Lumite (saran) upholstery manufactured by the Chicopee Manufacturing Corp., combined with a trim of vinyl chloride coated fabric. Other models feature upholstery of vinyl chloride coated fabric only.

Suppliers of the vinyl coated fabric upholstery include at least three sources, as follows: Textileather Corp., Toledo, Ohio (Tolex); U. S. Rubber Co., Mishawaka, Ind. (Naugahyde); and Federal Leather Co., Belleville, N. J., (Fedroid).

One of the accompanying photographs shows how Packard is using the vinyl chloride coated upholstery in its Super Convertible. The tough, scuff-resistant material is expected to stand up exceptionally well in service and also lends a modern touch.

Door and control knobs

Door lock knobs on these new cars are molded of vinyl chloride. This same material also makes

its appearance as a covering for robe cords and in the windlace, a tube-like stripping around the inside of the doors. This vinyl chloride coated stripping is supplied by George R. Carter Co., Detroit, Mich., Grand Rapids Fibre-Cord Co., Grand Rapids, Mich., and Bridgeport Fabric Co., Bridgeport, Conn.

Cellulose acetate butyrate interior control knobs are molded of Tenite II by Sobenite, Inc., South Bend, Ind. These knobs are supplied to Doehler-Jarvis Corp., Toledo, Ohio, which makes the hardware and assembles these interior components for final assembly by Packard. The steering wheel, also of cellulose acetate butyrate, is molded by Sheller Mfg. Co., Portland, Ind. An accompanying photograph shows the Tenite II panel and control buttons which operate all four windows automatically from the driver's seat of the new Super Convertible.

Acrylic in dials, roof lamps

Acrylic material also enters into the 1948 Packard interiors, being used for the cluster dials on the instrument board—which incorporate "black light" illumination—and in the horn button. The acrylic parts for the dials are molded by Hoosier Cardinal Corp., Evansville, Ind., who also produce the horn buttons. Another use of acrylic is in the formed sheet roof lamps of the new Packard taxicab, which are made by Cadillac Plastics Co., Detroit, Mich.

In addition to the foregoing plastic applications, Packard is utilizing phenolic components as electrical insulators, distributor caps, and related electrical parts.

As indicated by W. H. Graves, Packard executive engineer, the company recognizes that plastics have a legitimate place in the automotive industry and also prefers to approach them conservatively to insure that only good applications are adopted.

Good applications stressed

"The use of plastics in motor cars," states Mr. Graves, "will not in the immediate future become as popular as 'Sunday Supplement' articles would indicate. The use of materials in the plastic family will, however, always be an essential for automobiles in such places as steering wheels, most control operating handles, decorative features, novel lighting effects, and upholstery fabrics."

Four-button control panel driver's seat operates all four windows of convertible. Plate and knobs are molded of cellulose acetate butyrate

A typical application of acrylic is this one-piece taxicab roof lamp, formed from acrylic sheet stock

HOW PACKARD USES PLASTICS

TYPE	USE
Phenolic	Electrical insulators, distributor caps, etc.
Cellulose acetate butyrate	Interior control knobs, handles, bezels, steering wheels.
Acrylic	Horn button, instrument dial covers, taxicab roof lamp.
Vinyl chloride	Door lock knobs, coated fabric upholstery, windlace, and robe cover cords.
Vinylidene chloride	Woven filament upholstery.

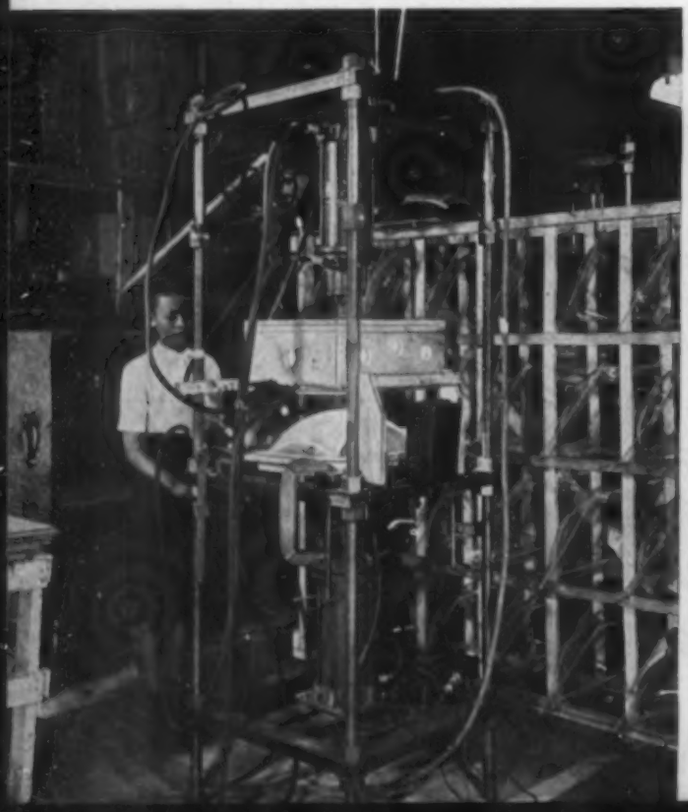
VIDEO IMAGES

Pictures of same set with and without Hexco lens show how image is enlarged without distortion or loss of clarity

LOOKING at television is fast becoming one of the country's favorite pastimes and one aspect of the resulting boom has opened up a new market for plastics. A majority of the television receivers sold have small screens (7 or 10 in.) and set owners are willing to pay any reasonable price for an accessory which will magnify the image. A number of companies saw the opening more or less simultaneously and several such accessories have appeared on the market, all based on the same principles.

Many companies in the field

The magnifying lenses made by various companies differ only in detail. They are all made of two pieces of acrylic sheet: a plane rear surface, and a formed convex front surface. All are filled with clear mineral oil or a similar liquid having the same index of refraction as acrylic. Therefore, the completed lens has the same magnifying power which it would have if it were solid acrylic. Most of the lenses produce an image about two to three times



View of press after forming cycle for front piece of lens. Note light source (behind acrylic piece) and box containing photo cell (right). Rack behind press holds formed pieces

Formed front piece of lens is bonded to flat piece with solvent cement and assembled lens is then clamped and allowed to dry for 24 hours. Outside surfaces of both pieces are sprayed with vinyl coating before assembly. Operator in background is welding metal supports which hold the finished lens in place on the television set

ENLARGED

Two-piece acrylic lens filled with clear mineral oil magnifies television screens two to three times

larger than the one on the television screen itself.

One version of this lens, called the Walco Tele-Vue-Lens, is fabricated of Plexiglas by E. L. Cournand & Co., New York, N. Y. Hexco Products, Inc., Chicago, Ill., uses Lucite to manufacture a lens which it markets as a proprietary item. The Radio Corporation of America developed and produced another version. Steiner Mfg. Co., Long Island City, N. Y., is currently making lenses on a custom basis for a number of different customers, and the Celomat Corp., New York, N. Y., is putting out a Plexiglas lens in which the flat rear sheet is tinted light blue, a color which is reported to reduce eyestrain.

The fabrication of lenses of this type presents a number of interesting problems. All surfaces of the acrylic have to be free of ripples or other defects which would cause optical distortion. The convex front surface cannot be free-formed because it must be rectangular like the television screen rather than spherical. At the same time, the use of a full male die to form the front surface of the lens would result in mark-off and, consequently, optical distortion.

Special presses built

The manner in which these and other production problems are being solved can best be illustrated by describing in some detail the procedure adopted by Hexco Products, Inc. The practices of other fabricators are similar.

The Hexco company is currently in production on lenses for 7-in. and 10-in. television screens. Lucite sheet ⅛ in. thick is used for the smaller lens, and ¼-in. Lucite for the larger lens. The weight of the completed large lens is 27 pounds. The smaller lens weighs about 8 pounds.

The company tried using an aluminum plunger to form the curved front piece of the lens but the aluminum caused uneven cooling of the acrylic ma-

Eight lenses can be filled with mineral oil simultaneously on specially designed rack, portion of which is visible in center. After filling and sealing, vinyl coating is stripped from back of lens and from center of front surface. Each lens is then packed in a carton along with the metal supports and screws needed to mount it. Border of lens rests on special frame; curved front surface does not touch the box

Operator at rear is rounding off the corner of an assembled lens with a router. Girl in center is running a sharp knife around the edge of copper mask so that operator in foreground can strip the sprayed vinyl coating from the outer edges of the lens. The bared portion of the lens can then be sprayed with a metallic lacquer to form an opaque frame around the lens image

terial, and a rippled surface resulted. It was then decided to free-form the bubble with air after a preliminary drawing operation had given the piece a rectangular, rather than a circular, shape.

Presses were specially built for the job, using two 6-in. air cylinders in each press. The cylinders are made by Hanna Engineering Works, Chicago, Ill. The top part of the press carries the draw ring and a box-like enclosure with a photo cell and light source which controls the height of the bubble. The lower cylinder carries a wooden plunger which looks like a letter tray with sides curved so that they are higher in the middle than at the corners.

Forming operation

The operator lays a preheated sheet of acrylic on the clamp ring and starts the press. The draw ring (and its box-like enclosure) comes down under air pressure and holds the plastic in place as the plunger comes up through the clamp ring. This partially forms the lens and produces an airtight seal against the clamp ring.

At this point, air is introduced through a small opening in the bottom of the plunger and the free-forming cycle begins. It was found that constant air pressure was not satisfactory for this operation; hence a "pulsing" cycle was worked out in which the bubble rises to the desired point, the photo cell beam is interrupted, the air is cut off, and sufficient air bleeds out to let the bubble fall. This pulsing action continues until the bubble is finally stabilized at its correct shape. The bubble breathes less and less deeply until the final shape is reached. The pulsing operation builds up additional strength in the piece through orientation of the material.

Both the draw ring and clamp ring are cooled, to allow faster cycles, by circulating tap water through ½-in., 20-gage square tubing mounted against them. The complete cycle takes 7 min. for the larger lens and 3½ min. for the 7-in. lens.

The photo cell control makes it possible to hold the bubble to close tolerances. Hexco holds the larger lens, which has an 11-in. radius, to plus or minus 0.030 in., or an error of 1% or less.

Assembly operations

After the forming operation, the bubbles are sprayed on the outside with a vinyl dispersion which protects the material from abrasion during the assembly operations. The spray used is Spraylat, made by the Spraylat Corp., New York, N. Y. The back pieces, which are supplied by Du Pont already cut to size, are also sprayed on one side. The sprayed pieces are then allowed to dry for 8 to 24 hours.

The unsprayed inside surfaces of both lens components are then cleaned thoroughly, and the two pieces are bonded together with a solvent cement. The assembled lenses are clamped and allowed to set for 24 hours.

The next step is to use a router to give the corners of the lenses their final shape and to drill the necessary holes for filling the lens and fastening it to the metal frame which holds it to the television set.

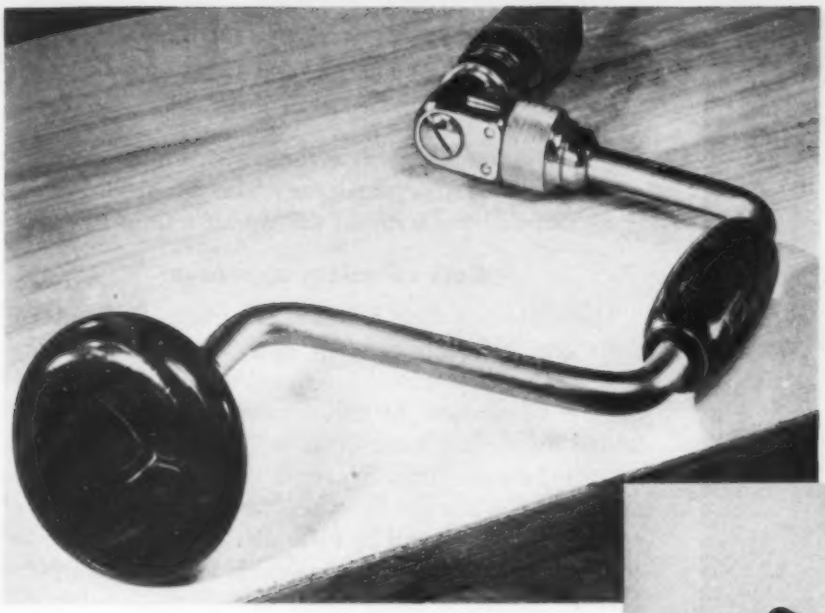
An operator then places a copper mask over the lens and goes around the border of the mask with a sharp knife. The Spraylat coating is then stripped from outer edges of the lens and the exposed portion of the acrylic is sprayed with a bronze metallic lacquer. This makes an opaque frame around the image formed by the lens.

Filling and packing

When the lacquer has dried, the lenses are filled wih mineral oil, and the fill hole is plugged with a ¼-in. self-tapping screw. Space is left to allow for expansion of the mineral oil. The fill hole plug will allow some leakage if the oil expands considerably, a safety factor which Hexco believes will eliminate the possibility that expanding oil might break the lens.

After the lenses have been filled and sealed, the Spraylat coating is stripped off. The lenses are then given a final cleaning and packed in individual corrugated containers. The metal supports and screws for mounting the lens are packed in corrugated paper sleeves which form a frame around the inside of the box. The border of the lens rests on this frame and the curved front of the lens is suspended below it. Thus the curved lens surface does not touch the box and is protected from damage during shipment.

Table model television set seems to produce an image as large as that of an expensive console model when it is fitted with formed acrylic Walco lens. Frame is metal



At left is an assembled bit-brace showing the plastic brace head and center piece. Both of these pieces are made of ethyl cellulose. Ethyl methyl ketone is used as a bonding agent in center piece. Little hand finishing is needed

Below are pictured the unassembled plastic parts as they come from the mold with the sprues still attached. The center pieces are produced in a four-cavity die, making two complete handles. The brace heads are made in a two-cavity die

Ethyl Cellulose for Tool Handles

WHEN the engineers at Peck, Stow & Wilcox, Southington, Conn., decided upon ethyl cellulose as the best plastic material to replace wood in their bit-brace handles, they pointed the way to a greatly expanded use of this tough and versatile material in the mechanics' tool industry.

With the knowledge that ethyl cellulose is an all-weather material with good dimensional stability over a wide temperature range, strength tests were made. Braces equipped with ethyl cellulose handles were dropped 20 ft. to a concrete floor—the metal part of the brace was distorted by the shock, but the plastic elements remained undamaged.

Convinced that they had found a material that would meet every structural requirement, the engineers sought to take advantage of the natural adaptability of plastics to speedy mass processing. The center piece was redesigned so that it could be molded in two sections and would ride on metal washers in grooves cut in the steel center rod.

Handle halves bonded

Simple jigs for mounting the center piece unit were designed to clamp the two halves together while the bonding operation was carried out. Ethyl methyl ketone is used as the bonding agent and provides a strong and satisfactory hair-line seam. The center piece is finished with a few quick strokes of a mill file followed by hand and power buffing. The brace head is attached to the quill with three Phillips-head self-tapping screws. The screw holes are spotted by the mold and then drilled.

The plastic parts for the bit-brace are molded for Peck, Stow & Wilcox by Colt Mfg. Co., Hartford, Conn., using Koppers ethyl cellulose. The center pieces are produced in a four-cavity mold and the brace heads in a two-cavity mold.

Since the finishing and assembly operations with plastic components were considerably less than those required when wooden parts were used, Peck, Stow & Wilcox found the length of their production cycle sharply reduced. Other manufacturing dividends also made themselves evident: scrapped parts caused by damage in handling were negligible; wooden parts were irregular in size—the plastic moldings were held to very close tolerances, permitting a much more uniform operation and a product of more consistent quality; delivery by the molder of pieces that required little or no supplementary finishing reduced overhead and operating costs.

Compression Molded

Trim and wearing surfaces on automobile doors show the decorative scope of new thermoplastic laminates

IT MAY come as a surprise to many in the plastics industry to learn that compression molding of thermoplastics is coming back. The original molding of thermoplastics was done by what was then the comparatively slow and costly process of compression molding. Later, injection molding replaced that process and compression molding of thermoplastics was practically discarded.

Now, however, with the introduction of several new products and processes by Woodall Industries, Inc., compression molding is returning to the thermoplastic field. Development engineers of this company have been working on this new series of processes which will permit them to produce a diversified group of plastics items for American industry. Although the company has worked with both thermosetting and thermoplastic materials, it is the progress made with thermoplastics that is the most interesting at the moment.

All of the new products are in the category of plastics and cover a wide range of application. Their versatility is great, and many different types will serve to meet requirements ranging from simple uses to those with more rigid specifications which demand qualities of strength, appearance, and permanence.

Included in this group is a new type of laminated material developed by the Woodall engineers which combines any choice of paper, woven paper, or fabric material laminated with clear resins by means of a new process. Large parts may also be produced in these same resins without the use of a filler or core.

Cost conscious approach

The materials with which these engineers produce their end products are not new, but the cost conscious approach which has been made has resulted in the adaptation of these materials to products which heretofore have been in higher price ranges. At the present time, Woodall Industries feels that the point has not yet been reached where the details of their processes can be fully disclosed, inasmuch as they are still carrying on research work for the purpose of reducing costs. Even though their methods have not been frozen, however, the processes have been so far advanced that it is possible for them to compete with other methods of production for actual commercial applications. The company states that as soon as the development of its products has reached a point of complete acceptance, details of the process will be given in technical papers.

Portable radio cabinets can use molded laminates to advantage for fine appearance and protective qualities

This new work with the thermoplastics is divided into two parts: 1) the production of a thermoplastic laminate, and 2) a method of producing an unsupported thermoplastic sheet. In both cases, it was necessary that a method be found for producing an unsupported sheet at a cost low enough to be attractive. Both the extrusion and casting methods for making sheet were analyzed; because of the cost factors of these methods of sheet production, it was felt that another approach was required. The engineers were convinced that if a new method could

Thermoplastic Laminates and Sheets

Unlimited applications are seen for laminates produced by modern developments of the original method of molding thermoplastics

be developed for producing thermoplastic sheet stock at a lower cost than present methods available, it would greatly enlarge the commercial use of such materials. If the sheet could be produced economically enough, the same processing used in the manufacture of thermoplastic fiberboards could be applied to these two materials, and the economies of such production, proved by past experience, could be utilized to advantage.

When a decorative thermoplastic laminate is required, resins are used which have all the characteristics necessary for the end product. In many cases this involves a high impact material having good dimensional stability and sufficient transparency to show any decorative pattern which might be designed into the core sheet.

In producing these laminates it was found that the resin must be applied in equal thickness to both sides of the core material to insure a stable product. If the resin were applied only to one side of the core, it would produce an unbalanced laminate which would have a serious tendency to warp. The core may be a woven paper with unlimited patterns woven into the body of the material. It may also be decorated with printed designs. A rayon fabric, with various weaves or decorated by printing, as well as cotton cloth handled in a similar manner, may be used for the core. The type of woven core material must be chosen so that, where post forming is required, it will prove sufficiently flexible to permit the end product to be shaped.

To date, Woodall has used only the three core materials mentioned above. Although its first approach to the thermoplastic laminate made use of cellulose acetate for laminating the core material, methods have been developed which make it possible to use not only cellulose acetate, but also cellulose acetate butyrate, ethyl cellulose, and methyl methacrylate either in clear, tinted, or opaque forms.

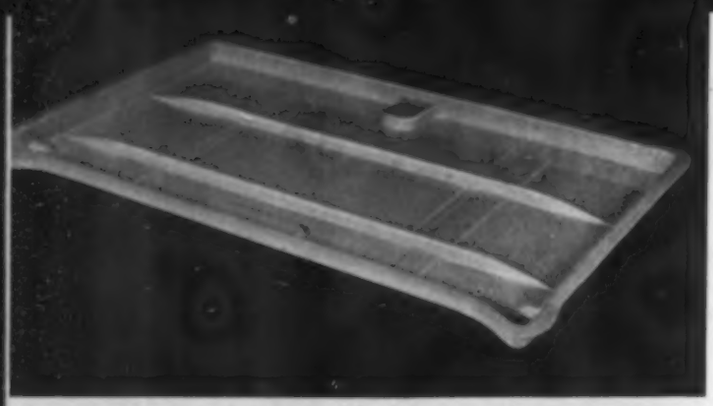
Production methods

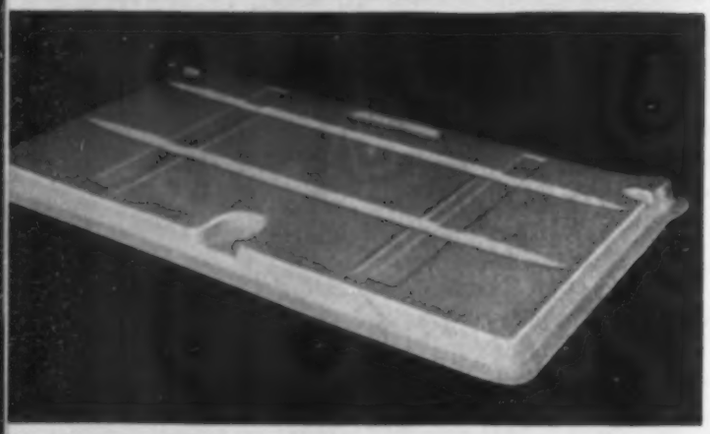
The present methods for producing these laminates are briefly as follows. Instead of sheet stock, *molding powder* and core material are compression molded into a laminate and to a blank determined by the shape and size of the finished part. After the laminate has cooled, the sheets are heated to forming temperature and then placed in a die to be drawn to the required shape. The over-all thickness of these materials varies from about 1/16 to 3/32 in., depending on the materials used. Naturally, the properties of the finished product must dictate the type of resin used. For example, if the product requires an excellent scuff resistance, then a resin suitable for this use is required. A fabric core with a proper resin will provide a structurally strong end product due to the very high impact strength of the combination of the two materials.

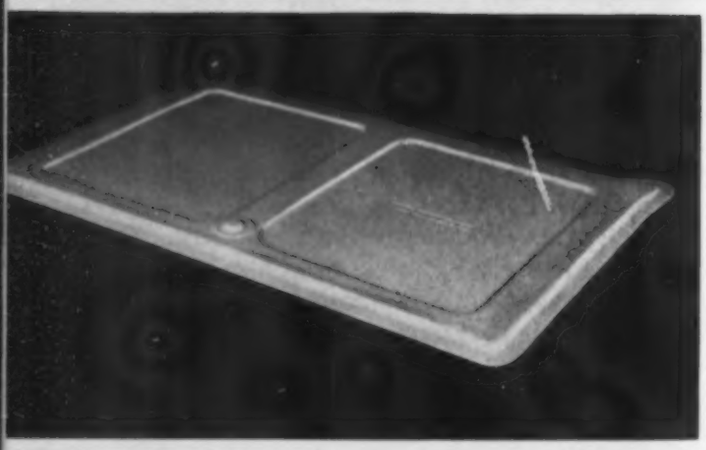
The first production use of this type of product was made on a printed paper with the resin on one side only. This provided strength, shape, and wearing qualities to a product for the toy industry. Although this application proved the molding process, it also indicated one of the weaknesses of a laminate

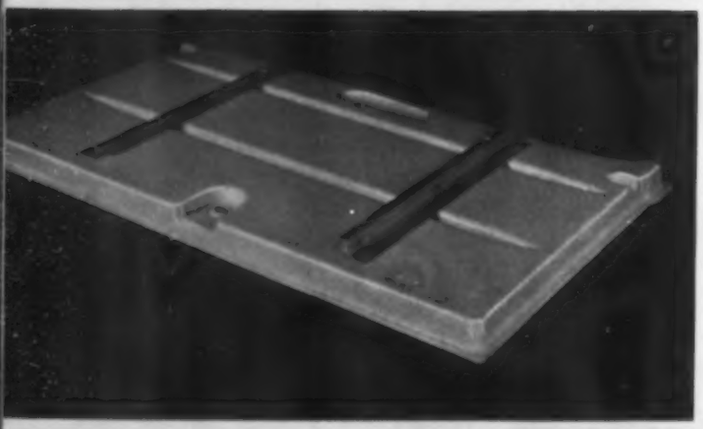
COLOR PLATES COURTESY WOODALL INDUSTRIES, INC., DETROIT, MICH.

Colorful decorative trays, shown here grouped with passenger car arm rests, indicate the wide range of utility and application for the new compression molded thermoplastic laminates made by the process described in the text









produced with resin on only one side of the core. The resulting unbalanced laminate would work—a point that is re-emphasized here only to give an example of the problems which are so frequently encountered when a developmental program is underway.

Complements injection molding

When it became apparent to the Woodall engineers that they could produce thermoplastic laminates cheaper with a molding compound than they could from extruded or cast sheet stock, they were convinced that their methods could also be used for producing unsupported sheet and, after subsequent forming, come up with a product which would complement injection molding. There is one important economic aspect to this application, however. The product in view must be large enough so that, if it were produced by injection molding, it would require the use of large types of injection molding equipment. Otherwise, in smaller pieces, the competitive advantages are not apparent.

At the present time, a large polystyrene part is being produced in direct competition with an injection molder. This part, a baffle or evaporator tray, is made up of two sections which are welded together into a single unit. The space between the two sections is filled with Fiberglas for insulating purposes. Since the parts are made of polystyrene, no particular advantage would have been gained by reinforcing the product through lamination; therefore, unsupported sheet was used.

Other uses

Further applications in the refrigeration industry which are under consideration for the new compression molded unsupported sheet include inner door panels, breaker strips, doors, lining panels, etc. The sheet's mechanical characteristics, when made of the correct materials, point toward other uses where high strength, tough, transparent housings and covers are required.

The decorative laminate materials seem to have unlimited applications. Such parts as automotive and bus interior panels as well as decorative wearing surfaces such as the trays and cushions illustrated are now in production. A portable radio cabinet is also being produced and a manufacturer of luggage is reported to be deeply interested in having his line produced from this material. And, as yet, only a start has been made in adapting this new-old method to the production of various plastics applications.

Refrigerator baffle or evaporator tray is made of two sections of compression molded thermoplastic laminate. Top to bottom: Inner surface of bottom section; outer surface of bottom section; inner surface of top section; bottom of completed tray after filling with insulation and welding; top of tray

Proving Plastics' Possibilities

Proper use, intelligent design, and good merchandising of plastics are the aims of a recently launched company program. It enlists the cooperation of molders, retail store buyers, and the consumers themselves

CONVINCED that there is a definite need for improving consumer confidence in plastics, The Dow Chemical Co. has launched a far-reaching campaign to obtain that confidence by enlisting the combined services of molders, retail store buyers, and the consumers themselves. In effect, the company is saying to the prospective purchaser of Dow plastics: "We are sure that plastics products made from our material will serve you faithfully and well. We are taking all precautions to see that every item featured in our program is carefully engineered to do the job expected of it; is made from material that can be depended upon to fulfill its mission; has met all the requirements necessary to perform its proper function when inspected by laboratory technicians and exacting consumers who have put it to the test."

The new Dow program is intended to meet the need for better understanding of the advantages and limitations of plastics and is part of the company's contribution toward the elimination of misapplication of plastic materials. The major part of the program will be devoted to Styron (Dow polystyrene) because of its wide use in household items and because of the large part it plays in Dow's plastics production. Company officials are frank to admit that they are primarily concerned with the welfare of their own materials; nevertheless, says Donald L. Gibb, head of plastics sales for Dow: "We cannot hope to carry the program alone, but we are convinced it is a step in the right direction and that it spotlights the need for the proper use of materials, intelligent design, and merchandising."

Six-point program

Officials of the company tacitly acknowledge that they are not the first to attempt to upgrade products made from their materials, but they do feel that they have gone much farther than others in obtaining the active cooperation of molders, buyers, and consumers.

The six points of the program are:

1) Technical evaluation of products,
2) Evaluation by consumer,
3) Evaluation by buyer,
4) Direct help to buyers,
5) Technical assistance to molders to correct faults in products before they reach the market,
6) The issuance by Dow of Styron labels which manufacturers of acceptable products may use on their products.

Five questions

The program operates like this: Dow field men work with molders to obtain samples of molded articles which are representative of commercial production. The samples are sent to the home office at Midland, Mich., and submitted to an evaluation committee made up of various company officials. The committee examines the sample with a view to answering these questions:

1. Can the item be satisfactorily molded from Styron?
2. Is the product designed to perform its function satisfactorily?
3. Has the molder taken full advantage of the properties that can be obtained from polystyrene in building his product?
4. Does the item perform its intended function as well or better in polystyrene than it would in other materials?
5. Has the manufacturer turned out the best possible type of workmanship?

The conference committee first determines whether or not additional tests are necessary in the evaluation laboratory. If there is any question of structural weakness or other defects, the item must undergo a series of severe testing methods. Then the items are distributed to a revolving panel of consumers scattered over the country who will put them to everyday use to ascertain how they react to washing, table use, or any other every-day wear and tear that may be expected in a normal home. These tests may consume from a week to several months, depending upon the function of the product. Already consumer panels have turned up blind spots that molders and producers never realized were a handicap to sales of their product.

Engineering details

Close scrutiny is given to the engineering work on every product submitted to the committee. For example, a tumbler designed with a beaded lip to give strength may seem adequate, but technicians have learned that, when gated on the lip, such a tumbler will break easily. Therefore the Styron label is withheld from such tumblers until the

molder changes the gate to the bottom of the tumbler.

Similarly, it has been found that the gate position on a comb makes a great difference in breakage of the comb's teeth, or that improper pigmentation or undue strain may result in stain or discoloration. The positioning of gates and prevention of weld lines are only a few of the many molding aids that Dow's technicians pass on to the molders and, so far, all of the recommended changes have been made. Reports on a given item are kept confidential and are sent only to the molder concerned, either with a permit to use the Styron trademark, or with recommendations on changes of material, design, engineering, or finishing that must be made before he can use the hallmark.

Only items which meet the exacting standards of the committee are used in Dow's advertising and merchandising campaign. Thus, the benefits of national promotion are an added inducement to improve products in line with the committee's suggestion.

Satisfactory cooperation

Many of the samples thus far submitted by molders have been declared unsatisfactory to carry the Styron label, but in all cases, the molders have been highly cooperative, appreciative, and willing to make the suggested changes. In fact, one of the most satisfactory results of the program so far has been the enthusiasm with which the molders have accepted it, according to company spokesmen. The next step to aid the molder may be evaluation of blue prints before a mold is made.

When the company originally conceived this idea, it chose polystyrene housewares as the first group to be considered because of their widespread use. Other projects will be developed during the year, but present concentration is confined to that field because of its importance to the plastics industry. Investigation revealed several hundred items originally sold in the housewares division. Not all of them could be tested in the time available and, of those chosen, only 36 were felt to be newsworthy and to meet all requirements. Of those 36, not all will be featured in advertising because some of them, such as funnels, have been on the market for eight years and are already well established. Eight out of the 36 were selected and divided into two sets of four to be featured in two different national advertisements.

Advertising aspects

The choice of national magazines was partially determined after consultation with various buyers of plastic items. In addition to mass media magazines, a group of publications like *Retailing Home Furnishings* was chosen to help obtain the attention of merchandisers. Magazines in the plastics field were, of course, included so that Dow might tell the story of what it was doing for molders and processors in order to arouse and hold their interest as well as to encourage them to strive for the privilege of using a Styron label. The advertising is concentrated to obtain the greatest possible impact in the shortest possible time: a normal four months' campaign has been packed into a six-week period.

When the program has been finally arranged, the Dow field men will again go to the molders to outline the campaign that is being put on, calling attention to their particular items. The molders will then go to their buyers and urge that particular sales attention be given to the currently widely advertised items.

The buyers are recognized as key figures in the successful working out of this program. There are scores of links involved in the process of tieing them into the campaign which can't be detailed here, but Dow has bent every effort to convince retail store buyers that they are a part of the plastics industry; that their efforts towards placing only satisfactory items on their counters are an essential part of the plastics industry's desire to see that only satisfactory plastics merchandise reaches the consumer. The Dow Chemical Co. believes that the buyer of a retail outlet is the consumers' buying agent and that information given him is almost certain to be transmitted to the consumer.

Salability tests

In order to encourage criticism and suggestions, revolving panels of buyers have been organized. Evaluated products are sent to them, together with full information as to the advertising and merchandising plans on the product. This gives the buyers an opportunity to conduct salability tests if they wish.

For months field men have been working with carefully picked buyers in scores of cities located at strategic points throughout the nation. These buyers are now well prepared to take advantage of the current campaign with counter displays, local advertising, and other selling aids. Direct-mail literature has been sent to them, as well as to other buyers whom it has not been possible to contact in person. Included in this mailing is a booklet containing illustrations of 36 houseware items made of Styron with the names of molders and distributors of each item. Attention is called to the fact that they have been tested by skilled technicians and evaluated for proper design, manufacturing technique, quality of workmanship, and suitability of Styron to the application. Everything possible is being done to enlist the cooperation of buyers and to keep them informed.

This entire program, designed to help eliminate plastics misapplications, depends upon cooperation between Dow, molders, and buyers. Company officials feel certain they have done enough implementation to make that cooperation profitable and thereby more certain of success.

Elastic Webbing

Light weight, low cost seats and berths have a polyvinyl extrusion in place of metal springs

by R. J. CONSIDINE*

COMFORTABLE, "springy" seats can now be built without metal springs. The job formerly done by the springs can be entrusted to an extruded polyvinyl chloride seat webbing called Thermo Seal, produced by Artisan Engineering and Manufacturing Co., Los Angeles, Calif.

Seats made with Thermo Seal webbing are lighter than those made with metal springs. In addition, the greater resilience of the webbing makes it possible to get the same amount of comfort with thinner cushions. This means a further reduction in over-all weight—and in costs.

The webbing was originally developed for use in airplane seats and berths, where weight is a primary consideration. But its economy and durability may well win it an important place in the fields of commercial seating, transportation seating, and porch and outdoor furniture.

No tendency to sag

Thermo Seal is said to have a slow spring characteristic with complete recovery and no tendency to sag. The cold flow and creep characteristics of thermoplastic resins have caused considerable difficulty in seat web supports in the past. To overcome this problem, preloading techniques were studied. Preloads of 25 to 37.5% proved successful, depending upon the web size and gage used. Installations of Thermo Seal webbing have been surge loaded to 340 lb. for more than 300,000 cycles with no indication of sag or permanent set in the web.

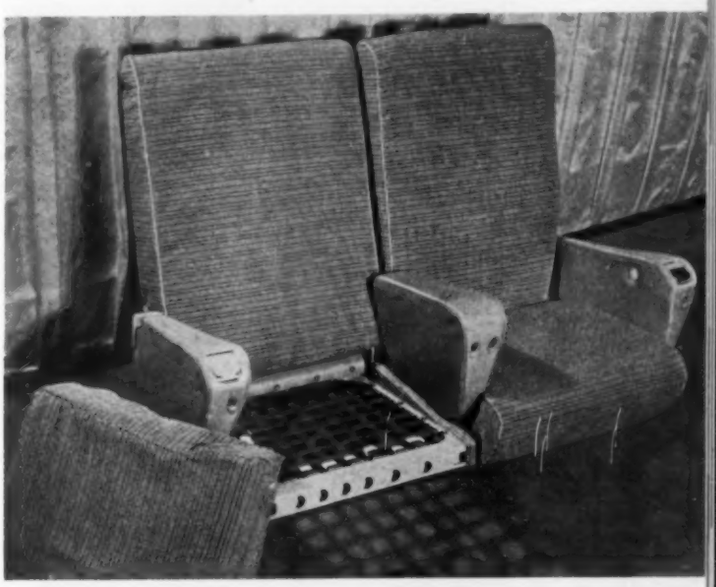
The manufacturer's tests show that an ultimate tensile strength of 3000 p.s.i. at 300% elongation can be guaranteed. The tests also indicate that the vinyl webbing has excellent resistance to extremes of heat and cold, exposure to the ultra-violet rays of the sun, exposure to salt air, and mildew.

End fittings heat sealed

An airframe manufacturing company developed the special compound of polyvinyl chloride used to extrude the webbing. The Artisan company devised special equipment to heat seal the end attachments so that fasteners could be incorporated in each length of webbing. These installation fittings are bonded to the webbing so as to allow for uniform load transfer in the bond area.

The type of fitting used depends upon the type of seat frame. A symmetrical hook is reported to be best with soft wood frames; an asymmetrical hook prevents grain splitting in hardwood frames. A special type hook has been designed for easy attachment to metal frames.

Designers can make use of three variables to control the resilience and flexibility of a seat webbed with Thermo Seal: web gage, web size, and web spacing. The material is available in 1, 1¼, and 2-in. widths, in thicknesses of 0.062, 0.080, and 0.12 inches, and in any desired length.



Airplane seats made with vinyl webbing are as comfortable as those made with metal springs, but are much lighter

Vinyl webbing is more resilient than metal springs; thus thinner cushions can be used without sacrificing comfort

*Chief design engineer, Artisan Engineering & Manufacturing Co., Los Angeles, Calif.

PLASTICS PRODUCTS

Pouring is easy with this white Du Pont nylon nursing bottle funnel which can be sterilized in boiling water. The cup-shaped top of the Tico funnel is molded with a flat projection large enough for a thumb and finger grip. Because it is unaffected by contact with alkalies and most acids used around the home, the funnel can be used for other pouring jobs. It is rustproof. Marketed by Terr Industries Co., 4732 St. Claire Ave., Cleveland 2, Ohio

An inventory of this handy kit for fresh or salt water fisherman shows 30 ft. of fishing line wound around the middle; two snelled hooks and a 44-in. length of nylon leader in one corked tube; two split shot, one clincher sinker, and a cork float with a screw eye in the other tube. Arnold Brilhart, Ltd., Mineola, N. Y., molds the one piece kit of transparent Tenite II cellulose acetate butyrate for Ashaway Line & Twine Mfg. Co., Ashaway, R. I. It is light in weight and can take rough handling

Attractive enough for the table, yet equally at home in the refrigerator is this new mixing bowl molded of Bakelite polyethylene and manufactured by Terr Industries Co., Cleveland, Ohio. Large enough for mixing food in sizeable quantity, the bowl has a matching cover to keep salad crisp and fresh until the hostess places it on the table

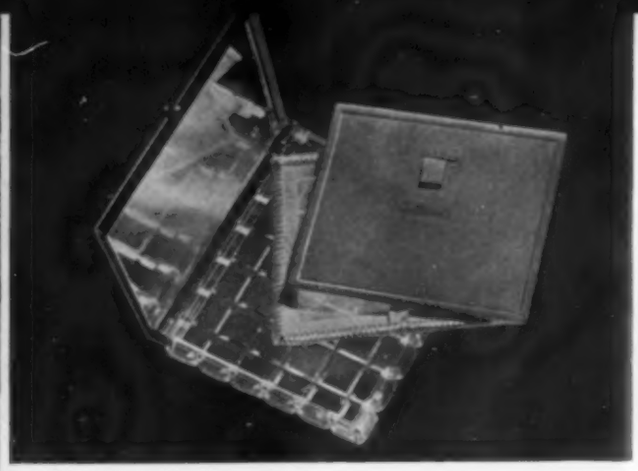
Adventurous members of the mouse family won't go far if there's a Little Champ mouse trap around. Manufactured by the American Trap Co. of America, Lititz, Pa., of Durez phenolic, the traps do not retain odors, are easy to set and designed to protect inquisitive tots and pets

Stripping of insulation from wires to make a connection is unnecessary with these Resinox phenolic plugs manufactured by Waterbury Companies, Inc., Waterbury, Conn. The plug is quite easy to use: The ends of the wire are placed on metal teeth, the top screwed on, and the connection is complete. A specially designed lip on the cover forces the wire down on the teeth, pushing them through the insulation

Polystyrene was selected for this table tennis paddle over other plastics materials because of its low warpage. About 5 oz. of red, yellow, blue, or green polystyrene are used by Plastic Industries, Kent, Ohio, to mold one paddle. The handles are hollow and a Styron adhesive is used to cement the rubber pads to the paddles. Luke Sewell & Co., Box 1248, Akron, Ohio, is distributor

Often screws on wood or metal must necessarily be placed in conspicuous places. With ornamental heads, such screws can enhance the appearance of a product. The decorative heads shown here are molded by Hafleigh & Co., Buchanan, Va., of urea or phenolic in multiple cavity dies similar to button molds. About 200,000 screws with ½-in. diameter heads can be turned out daily on one mold

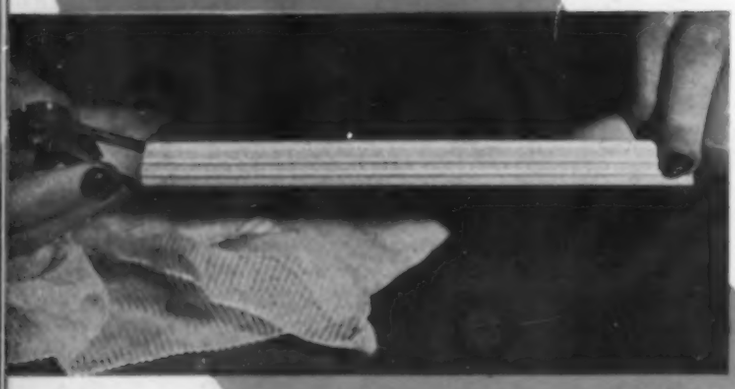
Sterling silver's beauty is on display at all times in this transparent Plexiglas chest deep drawn by Steiner Mfg. Co., 47-30 33rd St., Long Island City 1, N. Y., for International Silver Co., Station Square, Meriden, Conn. Acrylic handles and a tray which fits into the chest complete the unit. Bridges holding flatware are covered with velvet especially treated to prevent tarnishing



Slip out the powder compartment and this compact will hold cigarettes. The waffled base is molded of Plexiglas by Metal Specialty Co., Este Ave., B & O R. R., Cincinnati, for Wadsworth Watch Case Co., Inc., 385 Fifth Ave., N. Y., N. Y.

Insertion of maps, folders, etc., in loose leaf binders is made easier with this device fabricated from rigid Vinylite sheet and manufactured by the Staunch Sales Co., 343 E. 34th St., New York, N. Y. The sheet saves ring space and eliminates the need for punching holes in material being inserted. A strip with an adhesive backing is also available for ring-binding single sheets and pictures

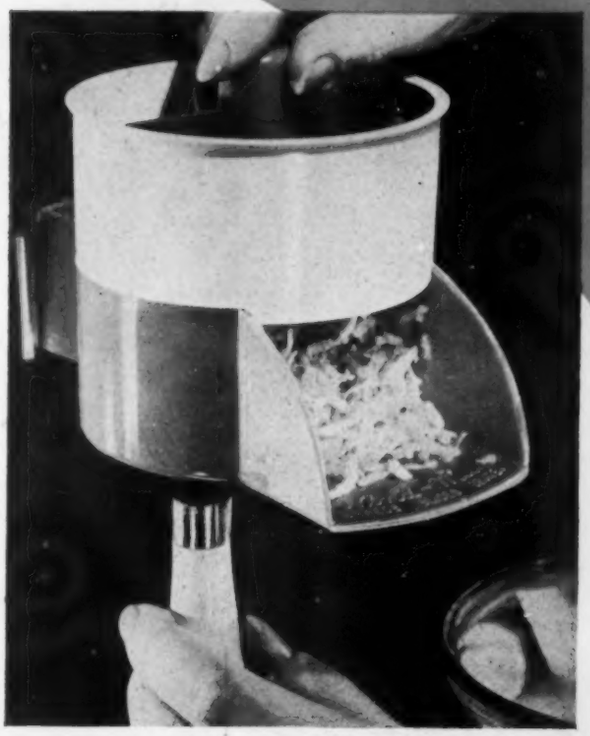
Both travellers and stay-at-homes find this clear vinyl container with a snap fastener quite handy for holding the Eversharp Schick Injector razor. Vanguard Corp., 29 Worthington St., Springfield 3, Mass., electronically seals the material at the edges and stamps the name of the razor in maroon on the container. The Firestone Industrial Products Co., Akron 17, Ohio, supplies the vinyl



The smooth surfaces of this Lustron curtain rod guide prevent curtains from snagging on the metal edge of a curtain rod as they are being threaded. Prong ends slip in and out of the curtain rod track with ease. The Paramount Mfg. Co., 511 Lancaster St., Leominster, Mass., markets these gayly colored polystyrene guides

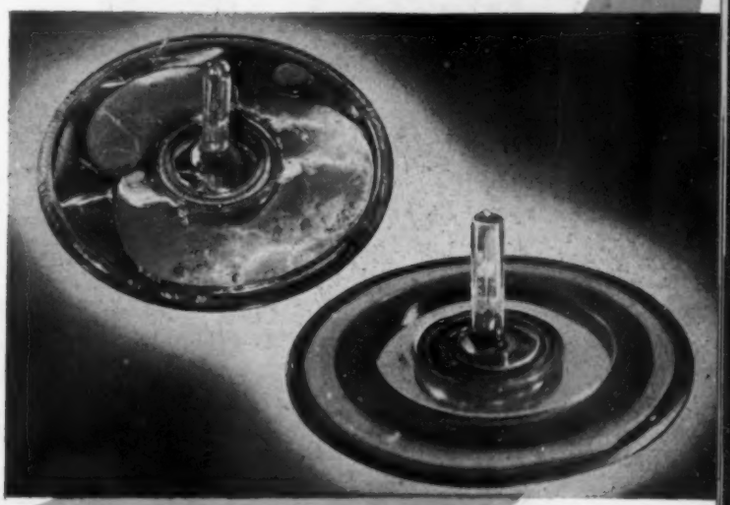
Non-movable parts of the Footmaster assure a quick and accurate fitting. A product of Herco, Inc., 24 E. 25th St., Baltimore 18, Md., this shoe fitting device is fabricated of Catalin. When a customer's foot is placed on the Footmaster, length and width are immediately visible to the shoe salesman. Both right and left feet from size 3 to 15 and from triple A to triple E can be measured

PLASTICS PRODUCTS



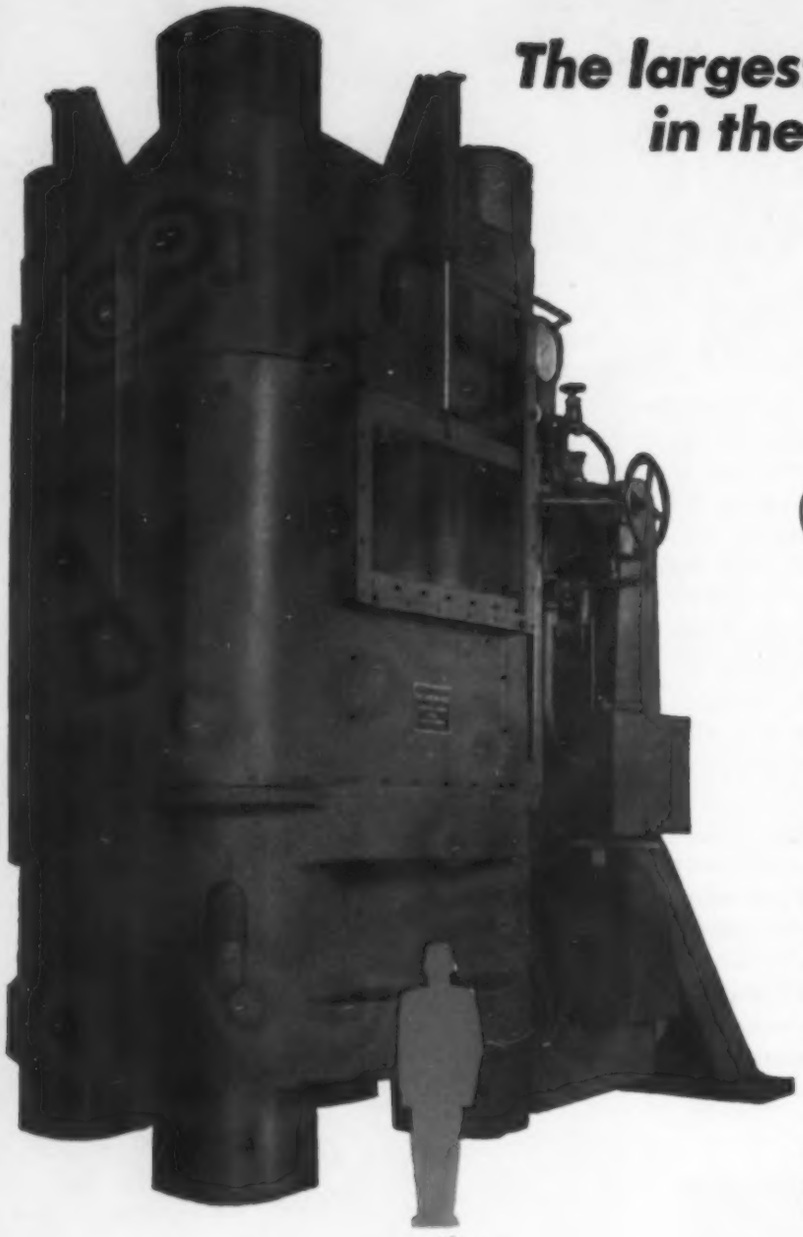
Uneven tempers and sore fingers from grating such toughies as carrots and cheese are things of the past with the Wind Mill which shreds, slices, or grates at the turn of a handle. Interchangeable stainless-steel disks do the cutting; a polystyrene cover presses vegetables, etc., against them. Fibro Corp., Garwood, N. J., molds the upper section of Wind Mill of white Tenite and the cornerless base of red, yellow, green, or black Tenite for Trade Winds Specialties, Box 46, Little River, Miami 38, Fla.

A user is being sold on an advertised product as long as the battery of this disposable flashlight key chain lasts. Stone Straw Corp., 900 Franklin St., N.E., Washington, D. C., makes the Lumarith container, button, lens, and end caps of this premium item for Falge Engineering Service, 4733 Elm St., Bethesda 14, Md. Fifty-gage cellulose acetate sheet is spirally wound to form the container. The end cap key chain hole is made in one press operation



Spinning, this top reveals gay bands of red, yellow, and blue; still, the blue and yellow are intermingled globules. The secret lies in the use of colored multi-density liquids; centrifugal force pulls the heavier emulsion to the edge of the top. Nalle Plastics, Inc., 108 W. Second St., Austin, Texas, molds the two flat disks and handle of top of polystyrene

The largest hobbing press in the plastics industry



Hobbed Cavities *by* Midland . . .

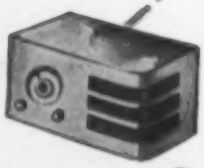
An important addition to Midland's expanding facilities is this 8000 ton hobbing press, the largest of its kind in the plastics industry.

This mammoth press with a ram diameter of 39½ inches makes it possible for Midland to hob cavities of approximately 80 square inches . . . almost tripling former hobbing limits.

With this press, Midland is prepared to supply plastic molders with hobbed cavities for large plastic parts including radio cabinets, large container escutcheons and instrument housings. Multiple cavities can be hobbed . . ."like peas in a pod". . . quickly, with complete uniformity and accuracy. Multiple cavities will speed up your production with a minimum of expense.

Midland experience and facilities, in addition to skilled craftsmen, are ready to serve you . . . to produce the finest and deliver on time when you specify "Hobbed Cavities by Midland."

Write for your copy of "How to Heat Treat Hobbed Cavities," a practical heat treating treatise to help you get the best performance from Hobbed Cavities by Midland.



Cavities for: Radio Cabinets

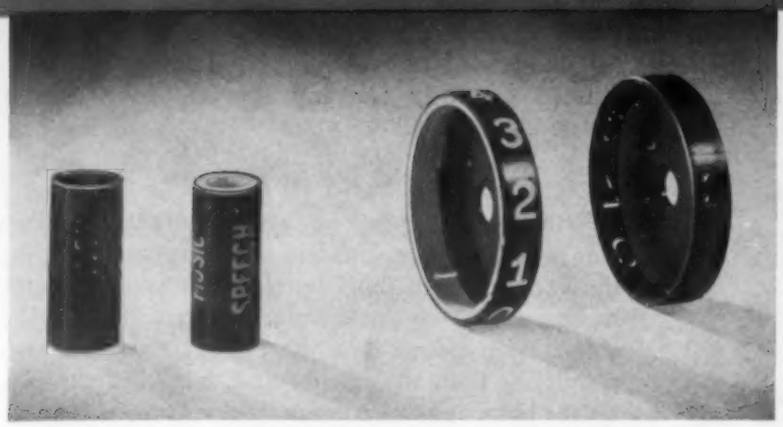
Escutcheons

Instrument Housings

MIDLAND DIE AND ENGRAVING COMPANY

1800 W. BERENICE AVENUE • • • CHICAGO, ILLINOIS

Makers of Plastic Molds ★ Die Cast Molds ★ Engraved Dies ★ Steel Stampings ★ Hobbings ★ Pantograph Engraving



Cylindrical control for auto radios and a counter dial, shown before and after second shot of multiple-shot molding process was completed

F. B. STANLEY, Engineering Editor

PLASTICS ENGINEERING*

Multiple-Shot Molded Parts

ALTHOUGH the desirability of combining two or more colors of plastic in a single finished molded piece, without the necessity of cementing together or otherwise fabricating individual pieces, has long been recognized, the many practical difficulties involved have tended to keep such work largely in the experimental stage. However, prior to the war, Gits Molding Corp., Chicago, Ill., had successfully developed a process to achieve this end and is now engaged in volume production of several injection molded parts involving its technique.

This company, a pioneer in injection molding in the Midwest, devoted a long period of study to this "multiple-shot" molding, as it termed the process, and made a number of parts in this manner prior to the war. Among the earliest commercial applications thus molded by Gits were Redington counter dials, which are used by the thousands on counters attached to punch presses, printing presses, and other types of industrial equipment. The Gits Molding Corp. has been issued a series of patents[1] covering the multiple-shot molding technique.

Automobile instrument components

The most important large-scale use of this technique to date centers around the group of instrument board components which Gits is now molding for the new line of Hudson motor cars. Involving the use of the process on such parts as clock and speedometer faces, radio dials, fuel and temperature gages, horn button, and gear shift lever knob, this application really brings the technique out in the open and suggests its future possibilities.

On the new Hudsons, the multiple-shot pieces are molded of cellulose acetate butyrate or polystyrene, combining a rich walnut grain or black color with translucent white.

On the speedometer face, clock face, radio dial, and fuel and temperature gages, the darker color is used as a background, while figures, letters and other markings are in white, permitting the use of glare-free instrument board illumination by means of small concealed incandescent lamps. In the horn button and gear shift lever knob, the dark and light colors are combined artistically to bring out distinctive design features.

The attainment of two colors in a single molded piece is primarily a die making problem, since the preliminary molded part is placed in a second mold and employed as an insert for the second shot. In the Hudson parts, the darker shot was molded first in some cases and last in others. However, tool design is but one of the factors which must be considered in this type of molding. Also of vital importance are such matters as selection of material, choice of colors to be combined in the finished piece, die temperature, and related factors.

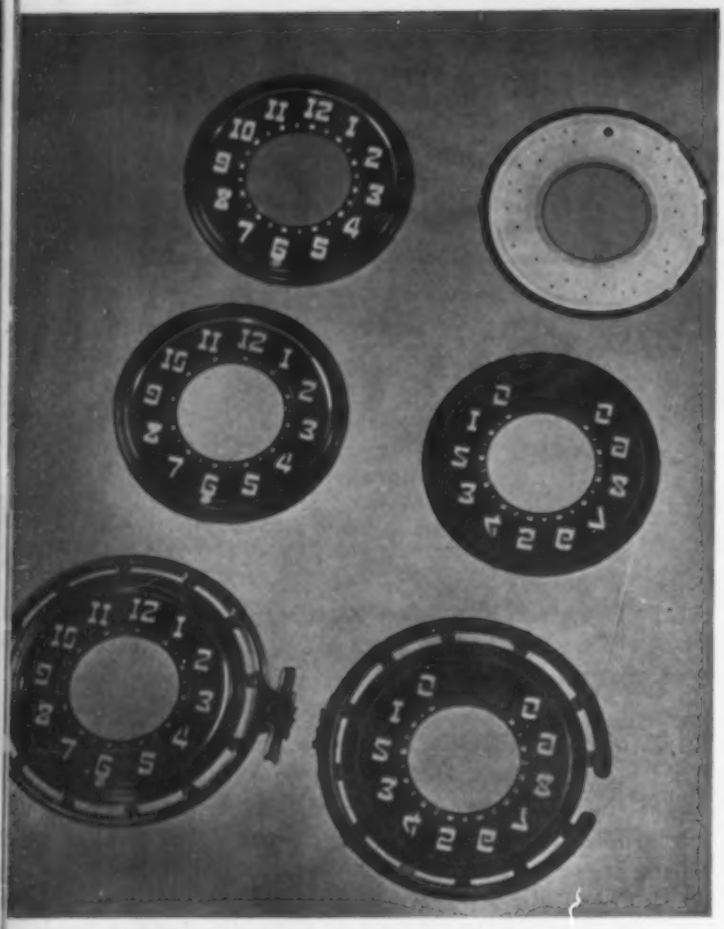
Characteristics of materials

It stands to reason that the first molded component must not be damaged when the second shot is made around it. For this reason, it is customary to use a material of somewhat harder flow characteristics for the first shot than for the second. This helps to prevent softening of the first shot when the second shot is made, which would result in burning or bleeding of colors. Naturally, any such color mingling spoils the clear-cut "inlay" effects which may be obtained with this process.

Gits also has found that the die must be at the proper temperature if best results are to be achieved with the multiple-shot technique. At the Gits plant,

*Reg. U. S. Patent Office.

[1] These are U. S. Patents No. 2,285,963, 2,288,187, 2,298,364, and 2,298,365. Among the licensees are such companies as General Electric Co., National Cash Register Co., Boonton Molding Co., Parker Appliance Co., and others.



Front of clock face, left, and back of speedometer dial. Bottom up: First shot, first shot trimmed, second shot

Radio strip dial of walnut colored plastic, in which a second shot of plastic fills in letters and numerals

die temperature is closely regulated by means of circulating oil reaching both halves of the mold. Exact temperature of the die depends largely on the size of the first shot and may range from 180 to 300° F. If the first shot is large in volume, die temperature on the second shot may be run up higher than if the first shot is small. Material in the two shots should be of the same type in order to achieve the ultimate in appearance and service from the finished casting. It is possible to combine two types of plastic in one piece, but such a combination should be studied carefully for any special problems thus created.

Shrinkage no problem

Although it might be assumed that shrinkage would be a serious problem in this type of molding, the experience of the Gits company on this matter has revealed very little trouble with shrinkage. The softer flow material in the second shot has more plasticizer than that in the first, but after the plasticizer has dried out, the first and second components of the molding match each other closely in physical characteristics. Freedom from "locked in" strains, achieved through proper die design and close attention to molding technique, produces a composite molding which has no tendency to wrap or come apart at the seams.

Features of this molding technique, and some of the problems which it entails, may best be studied by direct reference to the accompanying photographs of parts which have been produced by Gits through the use of the multiple-shot process.

The Hudson clock and speedometer faces require similar techniques. These faces, measuring approximately 4⅞ in. in diameter, are produced on an 8-oz. Reed-Prentice injection press in a two-cavity die which makes one of each. The gating method used for both shots is of special interest. The pieces employ a tangential type of runner with 12 gates spaced at equal intervals around each face. This system of gating was adopted to minimize bleeding at the gate and to eliminate weld marks. The multiple gates minimize the volume of material which must flow past any one gate, and thus cut down the possibility of overheating and bleeding on the second shot, when the translucent white material is injected. The dark shots are made first, then placed in a two-cavity die for the second shot on the same type of machine.

Ring protects first shot

Another precaution against bleeding of the two shots is the use of a spring-steel ring which is laid over each of the first dial shots when it is placed in the die for the second shot. This ring, approximately 1/16 in. thick, covers the outer rim of the dial itself and protects it against overheating when the second shot is injected. The dies are so designed, in fact, that the gates of the second shot pass directly over this steel rim. The finished piece is placed in a kick press which pushes the ring free, simultaneously breaking off all 12 gates as it leaves the piece.

Small blind openings in the back of the first shots, near the outer edge, provide for additional bonding action between the first and second shots. On the clock face, there are 41 molded-in openings in the darker shot through which the white material is later injected to form the finished piece. These in-

clude the numbers and other markings, which are at 2½ and 5-min. intervals. Openings in the first shot are slightly tapered to facilitate its removal from the mold.

When the translucent white material comes through on the second shot, the finished markings stand out in relief from the black or walnut face. Only a small amount of the white plastic may be seen from the front of the piece; a much larger volume covers the back of the dark shot, adhering tightly to it because of the many points at which they interlock and producing a finished piece with considerable rigidity. Also, the dies are so designed that the white figures overlap about 0.005, giving a further locking action between the two shots.

Pin supports

The first shot is held perfectly flat during injection of the second shot by a number of small pins on the punch, so distributed as to contact the back of the first shot at many points near the outside edge when the die closes. Without this support from the back, the dark shot might have a tendency to buckle under the pressure of the second shot.

The speedometer face, which is combined with the clock face on a single sprue, involves the same or similar treatment all the way through. Both pieces, when completed, have sufficient strength to withstand much more strain than they will ever receive in normal service.

Close attention to design details is necessary to make full use of this process on such units as the clock and speedometer faces. Most numbers, for example, entail no special difficulty; they may be formed of a single opening of the proper shape. The simplest are those such as 1, 2, 3, and 7. Numbers like 5, 6, 8, and 9 require more intricate tooling, while 0 and 4, which normally include sections which would be cut out entirely, are actually composed of two closely-fitting openings. If desired, however, they too may be designed so that dark areas are completely enclosed by white, as described later.

The same general problems encountered on the speedometer and clock face are present in lesser degree on the Hudson radio strip dial and temperature and fuel gages. Except for the radio dial, which is bordered on the front side by a raised edge along the bottom and both ends, and also curves back at the top, these parts are essentially flat and entail the injection of white thermoplastic material through stencil-like openings cored in the darker component. In each instance, a layer of the white material also covers most of the back of the first shot, affording the required rigidity in the finished piece. On these smaller parts, a small margin is left around the edge of the white shot, permitting the use of a rim on the punch which holds the dark piece flat in the die when the second shot is made.

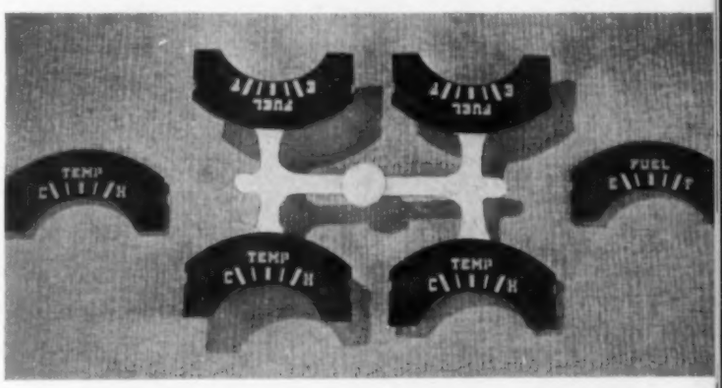
On the multiple-shot horn button, the ivory component is made first. Edge-gated, this shot is produced in a four-cavity mold on an 8-oz. Reed-Prentice press. Measuring just under 3⅜ in. in diameter, the ivory shot is a saucer-like piece with a wall thickness of approximately 3/32 inch. The characteristic diamond-shaped Hudson design is cored out of the center of this molding.

Projections for strength, looks

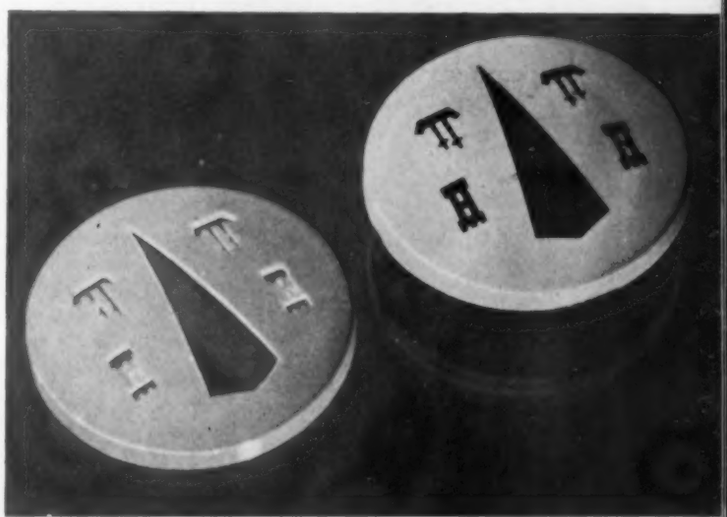
Of special interest from the standpoint of tooling is the handling of the two castles and ship designs on this piece. The cavity is designed with projections which make it possible to mold this piece with two small "islands" standing up on each castle figure, to give the finished design the proper effect. These small projections are supported by flat webs of material in the white shot; bottom surface of the webs is flush with the inside surface of this casting. A similar detail is used on the smaller mast of the two boat figures, to give mechanical reinforcement to the relatively long finger of material between the masts and to provide an opportunity

(*Please turn to page* 134)

Fuel and temperature gage dials are molded simultaneously. At left and right are complete, trimmed dials



Multiple-shot molded horn button. At the left is first shot in ivory; at the right is the finished button



Why

a Plaskon Molding Compound is used to house this new sales-maker for beauty shops

Plaskon Molded Color

invites inquiries, and stimulates business

ATTRACTIVE, smart product design . . . so important for developing interest in a highly specialized item such as the Nestle Fleetwave . . . can be readily achieved with Plaskon Molded Color. Plaskon Molding Compounds can be quickly and economically transformed into any practical shape or size. Specifications calling for tolerances to accommodate mechanism or other assembly parts can be me

STRONG, durable Plaskon Molded Color has high tensile and compressive strength. Plaskon Molding Compounds are *thermosetting* . . . they will not sag, soften, warp or distort under normal heat conditions. Molded Plaskon's overall service ability meets a wide range of product requirements.

SCINTILLATING, lustrous Plaskon colors are magnets for admiring eyes, and open the way to easier sales for molded products or their services. Plaskon Molded Color is permanent, unfading. Its glowing, chromatic surface is smooth, warm, inviting to the touch. Where color and appearance are important in the function of any product, Plaskon offers exceptional manufacturing and sales advantages.

Our experienced technical and field men are available to help you adapt thermosetting Plaskon Molding Compounds to your particular needs. Write for free illustrated book on Plaskon Molded Color.*

*Reg. U. S. Pat.Off.

PLASKON DIVISION **LIBBEY • OWENS • FORD GLASS COMPANY**

2121 SYLVAN AVENUE, TOLEDO 6, OHIO

In Canada: Canadian Industries Ltd., Montreal, P.Q.

catches the eye,

for the new *Nestle Fleetwave*

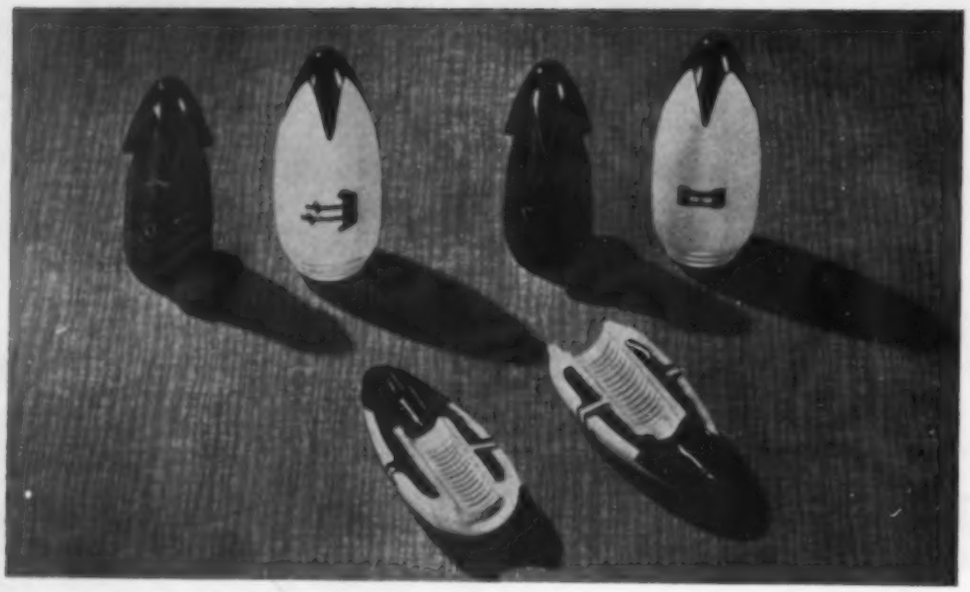
PERMANENT WAVING MACHINE

The Nestle Fleetwave housing is 21¾" wide, 18¼" deep, 10½" high. It is molded by General Electric Company, Meriden, Conn.

PLASKON

TRADE MARK REGISTERED

MOLDED COLOR



Gear shift lever knob, showing the three decorated portions. At bottom is a knob cut through the center. Note that the ivory material of the second shot completely surrounds the darker material of the first operation

for the material in the second shot to flow in and interlock at these points.

The second, or darker, shot on the horn button actually contains much more material than the first, although this is not apparent from the front of the finished piece. The second shot, made in a four-cavity mold on an 8-oz. Reed-Prentice press, fills out the diamond shaped opening, the ships, and the castle figures, leaving the finished piece with a perfectly flush top surface. On the back, this second shot also forms a heavy central hub which is deeply cored to provide for its attachment to the steering column and horn switch.

Edge-gated, the hub also contains a series of tapered-wall slots on its outer surface, which make it possible to slip the finished button in place on the steering column, twist it slightly and lock it in position by means of spring clips which engage the notches.

Strength added

Concealed in the finished horn button is another detail which adds to the strength and utility of the piece. This is an interlocking feature between the two injection shots around the outer rim of the button, made possible by designing a continuous groove in the white piece into which the second shot can anchor. Such construction constitutes an added safeguard against warpage and separation.

In the Hudson gear shift lever knob, the first shot is the darker portion, which in the finished knob comes to the surface at only three points—the four-pronged tip design, the ship outline, and the castle figure. This first shot is deeply cored and has these design features in relief. It is produced in an 8-cavity die on an 8-oz. Reed-Prentice press. The second, or ivory shot, forms most of the outer surface of the finished knob and also fills out most of the core left open in the first shot. Threads are tapped in the finished knob.

In the final molding, the castle and ship figures are completely surrounded by white material. Material which forms small white blocks in the castle and space between the masts in the ship reaches these areas through tiny passages extending into the core of the first molding. Another function served by these openings is the release of air which might otherwise be entrapped in the first shot. The cut-through section of this knob clearly shows its internal structure and emphasizes the tooling problems.

Drum dials

Further indicative of what may be accomplished with this injection molding technique are some of the other parts illustrated herewith, produced by the Gits organization prior to the Hudson group of instruments. The drum dial for Redington counting machines and cylindrical control for auto radios were both made by combining the first (black) shot with a white shot which came through from the inside of the first to form flush numbers or letters. On these parts, the problem was about the same as that involved on the Hudson horn button and gear shift lever knob.

The large radio strip dial has a first shot molded of light colored walnut material, with a second shot of clear material which fills in the calibrations, letters, etc., on both exterior faces and covers most of the back of the piece.

Other uses

Another important development in the use of multiple-shot molding is with reference to molding one intricate piece onto another, thus producing a product which, in shape and design, could not possibly be molded on any known type of machine or mold. The Gits Co. points out that here the process can yield intricate designs and shapes while eliminating great amounts of assembly work and very expensive tools, dies, and equipment.

This kind of scene is on the way out...

This advertisement first appeared a few months ago. Two reactions to it were these: (a) department store and chain store buyers strengthened their efforts to see that manufacturers of plastic products supply informative labelling, leaflets or other point-of-sale information about their merchandise . . .

. . . and (b), molders of plastic products requested reprints of each advertisement in this series for use in further promoting the idea of "the right plastic, properly applied, in a product of correct design."

Cooperation of this kind is making it possible for wholesalers, retailers and consumers to quickly understand just what can be expected from each particular plastic item.

All that glistens is not sold

...when they don't know their plastics

The sink strainer in this poor salesman's hand has *everything* the lady wants . . . but he doesn't know it or know *why*. No sale . . . for *both* are uninformed about plastics.

Here's what informative labelling would tell about kitchen items (strainers, funnels, measuring cups, etc.) made of Cyanamid's *thermosetting* plastics:

MELMAC® plastics, for instance: 1. Will never soften under exposure to heat (even boiling water). 2. Won't catch fire. 3. Won't attract dust. 4. Will not be damaged by household cleaning fluids or commercial solvents. 5. Will not shatter (however, it is *not* unbreakable). 6. Won't rust or chip . . . its color goes all the way through.

. . . or BEETLE® plastics: 1. Can be washed in hot water, like china or glass. 2. Can be cleaned with ordinary cleaning fluids. 3. Easy to keep dust-free. 4. Durable, shatter-resistant (but will break with overly severe treatment). 5. Will not catch on fire. 6. All color . . . no chipping or rusting.

Remember, *no one plastic serves all plastic needs.* So, look for informative labelling.

BE SURE YOU KNOW THE DIFFERENCE

Two plastic products may look exactly alike. The difference is that one is made of the right plastic, properly designed and applied. So, when buying, selling or making plastic products or parts, request information that will assure you they are soundly designed in the plastic best suited for the job.

QUESTIONS PLEASE! Our technical staff will be glad to help you solve problems in plastic application and design. And if our materials do not fill the bill exactly, we will cheerfully direct you to the right sources. American Cyanamid Company, Plastics Division, 32 Rockefeller Plaza, New York 20, N. Y.

BEETLE® plastics—urea-formaldehyde thermosetting molding compounds. MELMAC® plastics—melamine-formaldehyde thermosetting molding compounds, industrial and laminating resins. URAC® resins—urea-formaldehyde thermosetting industrial resins and adhesives. MELURAC® resins—melamine-urea-formaldehyde thermosetting adhesive and laminating resins. LAMINAC® resins—thermosetting polyester resins.
®Reg. U. S. Pat. Off.

Cyanamid

Plastics

DIVISION OF AMERICAN CYANAMID COMPANY

BEETLE plastic box developed for The Gruen Watch Company, Cincinnati, by The Electric City Box Company, Buffalo, and molded by Rathbun Molding Corporation, Salamanca, N. Y.

colorful, lustrous Beetle plastic makes a perfect setting for sales*

The Gruen Watch Company wanted a box of a material that would speak *instantly* of high quality for watches that do the same. So BEETLE plastic was selected . . . as ideal for eye-appeal and for molding characteristics that readily accommodate special hinge constructions such as the Rathbun Triplex Spring Hinge specified for this box.

The happy result is a package that attracts the eye to *any* counter, to *any* display case . . . a container with a smooth-as-velvet texture, a high-quality effect that makes a proper setting for sales.

But BEETLE plastic does more than *look* like quality. This low-cost, easy-to-mold compound *acts* like quality, too. It is chemically inert, dimensionally stable, highly resistant to abrasion, wear and impact. It is easy to clean . . . does not gather dust . . . and its extremely light weight belies its great strength.

If *you* want a packaging material molded of BEETLE plastic . . . with its permanently attractive colors and its many other desirable qualities . . . consult your molder or Cyanamid today.

American Cyanamid Company, Plastics Division, 32 Rockefeller Plaza, New York 20, N. Y.

BEETLE® plastics – urea-formaldehyde thermosetting molding compounds. MELMAC® plastics–melamine-formaldehyde thermosetting molding compounds, industrial and laminating resins. UMAC® resins–urea-formaldehyde thermosetting industrial resins and adhesives. MELUMAC® resins–melamine-urea-formaldehyde thermosetting resin adhesives and laminating resins. LAMINAC® resins–thermosetting polyester resins. **Reg. U. S. Pat. Off.*

Cyanamid Plastics

Duplex Press Cuts Costs

SPECIAL eye-cups used in Bausch & Lomb safety goggles are now being molded at the Auburn Button Works, Inc., Auburn, N. Y., on an upstroke duplex molding press. The unit is one of a newly designed line of such presses developed by the Lake Erie Engineering Corp., Buffalo, N. Y.

The material used in the goggle eye-cups is a nodular type rag-filled high-impact phenolic material manufactured by Durez. In estimating the costs on this job, it was found that a 4-cavity mold designed into a duplex press would produce these parts at approximately the same speed as a 12-cavity compression type mold. Further, it was well known that the finishing problems with compression molded pieces would necessitate several difficult hand filing and polishing operations. Even though the greatest care was taken in these finishing operations, the resulting product would not have as good an appearance and finish as those produced by the faster method, because with this latter method the parts would have no flash or fin to remove. The only finishing operation that would be required would be the removal of a small gate.

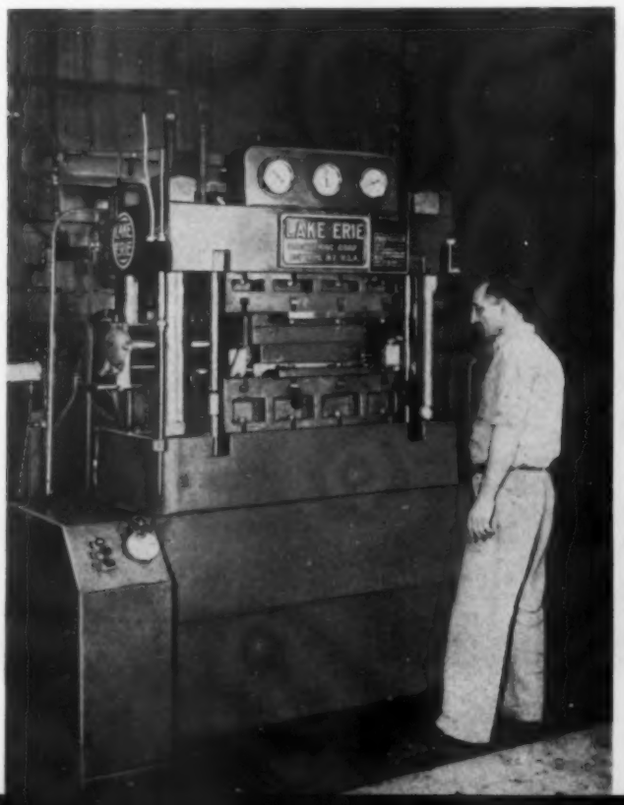
The type of molding used on this goggle eye-cup job is one which has greatly increased in use during the past several years. Generally classified as transfer molding, this method, with slight variations, has been termed electronic, hy-speed, plunger, open pot, and duplex. Even though there are differences in technique, mold design, and press equipment, the basic principle remains the same. The material (in many cases preheated) is forced from what might be classified as a pressure chamber through runners to gates and thence into the cavities of the mold. Among the many advantages attributed to this method of molding are elimination of practically all flash, reduced pressure on mold parts, and decreased time of the cycle of operation as compared to that encountered in compression molding.

Ram within a ram

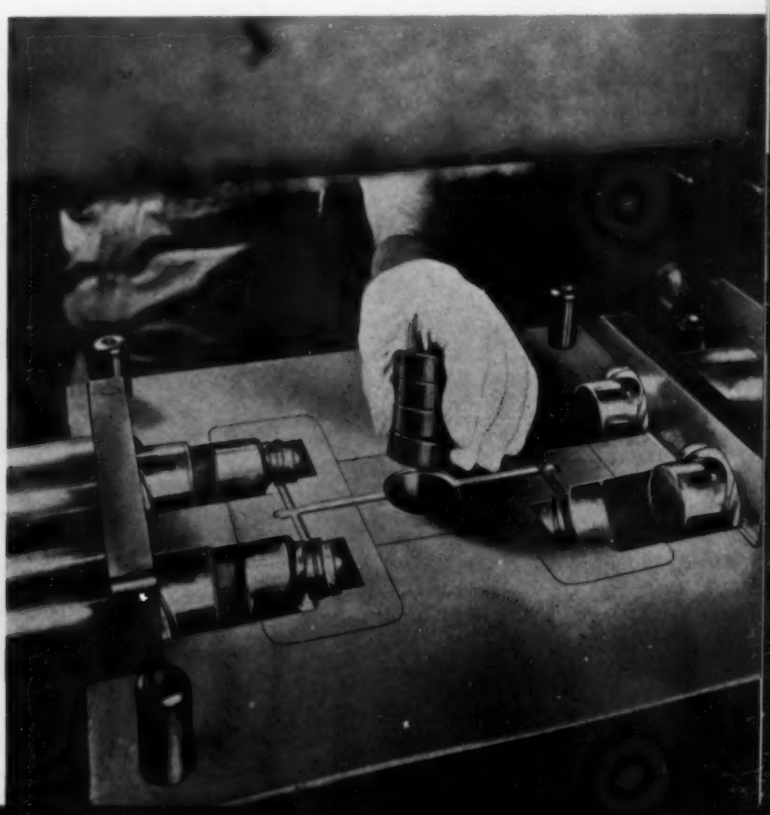
The Lake Erie presses designed for this type of molding operation are called duplex presses because the transfer ram is designed into the main or clamping ram. This type of press is sometimes called a "ram within a ram"; a machined hole in the center of the clamping ram acts as the bushing for the secondary ram. With this type of press, loading is simple. The preform is placed on top of the transfer ram when the mold is in the open position, and the transfer ram operates instantaneously when the clamp is closed and under pressure.

In the press at Auburn, shown in the illustrations below, four preheated preforms are loaded into the pressure chamber, after which the molding is accomplished with a minimum of waste motion.

Few finishing operations, reduced pressure on mold parts, and decreased operating time are among the advantages of the new upstroke duplex molding press which is shown below



Four preheated preforms used to produce phenolic goggle eye cups are being loaded into the pressure chamber of press. From this chamber they will be forced through runners to gates, and into cavities of the mold



Postforming Laminates

Successful production depends largely upon control of temperature and the heating period

by FRANK SULLIVAN

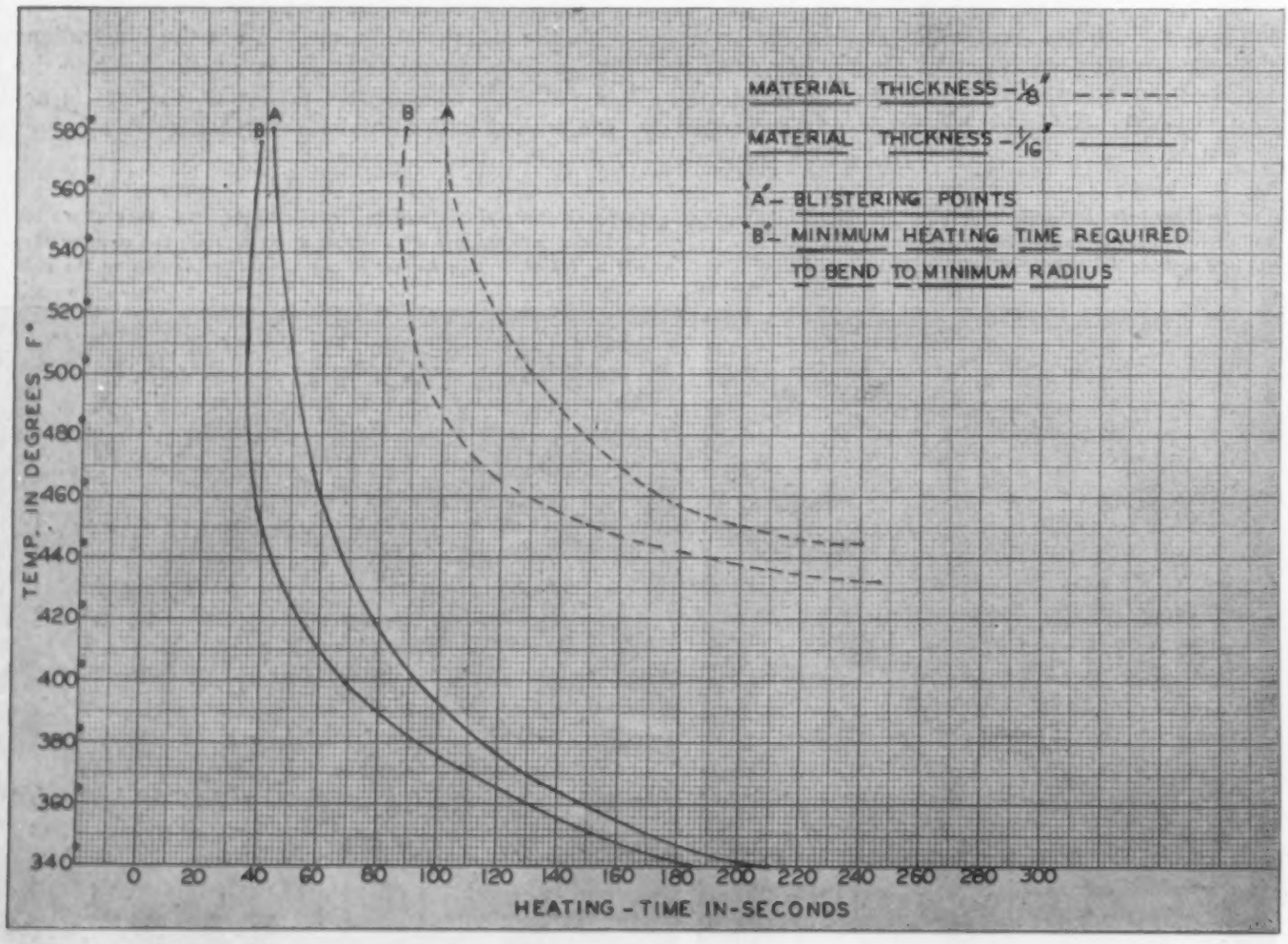
THE grades of laminated plastics available for postforming have increased from one basic material, used chiefly in the fabrication of airplane parts during the war, to a series of materials adaptable for both decorative and industrial purposes.

For industrial applications, two types of material are available. The fabric-base forming stock meeting N.E.M.A. Grade C requirements, which is similar to the war-time material, is used in the great majority of industrial applications. It is suitable for laminated plastic sheet material which is required to make simple bends or to be drawn into contours. Sheets of this material find application in aircraft, automotive, refrigeration, hosiery mills, electrical and many other fields.

Industrial paper-base forming materials have not been used as widely as fabric base because the fiber structure of the paper does not lend itself to the formation of deep draws or complex contours. However, simple bends are possible and, where this material is applicable, it provides a less expensive forming material. In addition, the rigidity of the formed part is somewhat greater than that achieved with fabric-base materials. At points of maximum stress some color change will be evident, but the surface

*Project Engineer, Formica Insulation Co.

1—Blistering point of a laminate is dangerously close to minimum heat required to bend it to minimum radius. Widest leeway possible with 1/16-in. material is 12 seconds. At high temperatures, material will blister if heated only 4 seconds too long



will be more uniform than with fabric base due to the absence of thread structure.

Decorative veneer stock in printed designs or solid colors is on the market in limited quantities. Many of the applications for this material have been of an experimental nature and field tests are in progress to determine their suitability.

Both industrial and decorative materials can be formed in a wide variety of production set-ups. Four steps are necessary to transfer the flat sheet to the finished article. These are: 1) cutting to shape, 2) heating the material to a formable condition, 3) shaping, and 4) cooling.

The equipment required to cut the desired shape

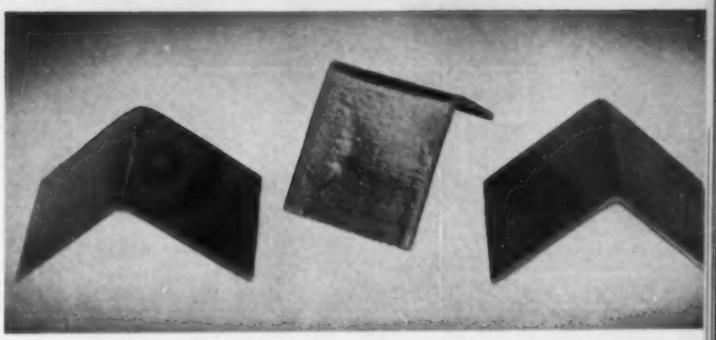
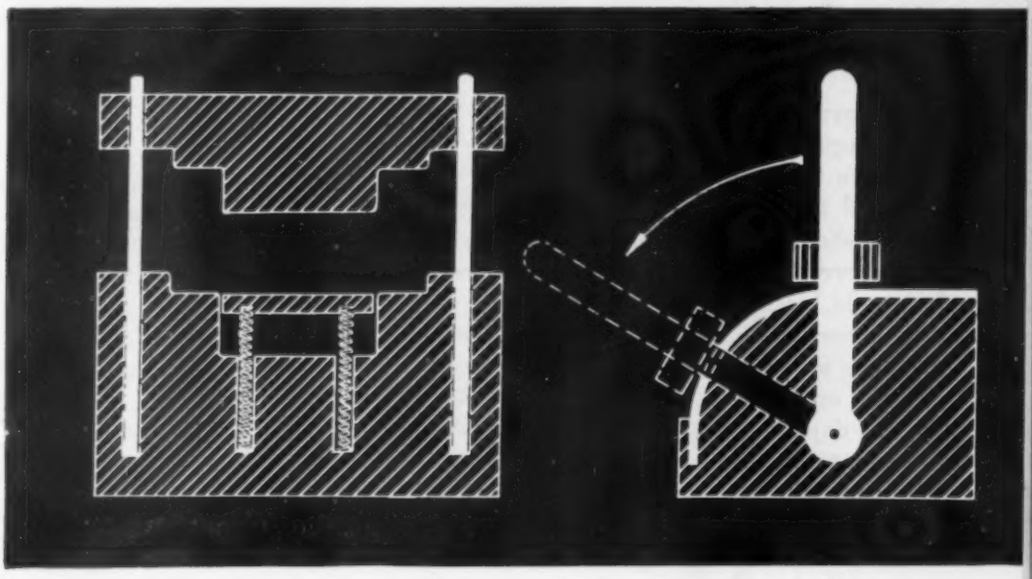


PHOTO COURTESY FORMICA INSULATION CO.

2—Insufficiently heated material (left) breaks when formed. Too much heat causes blisters in the material (center). Piece shown at right was correctly heated

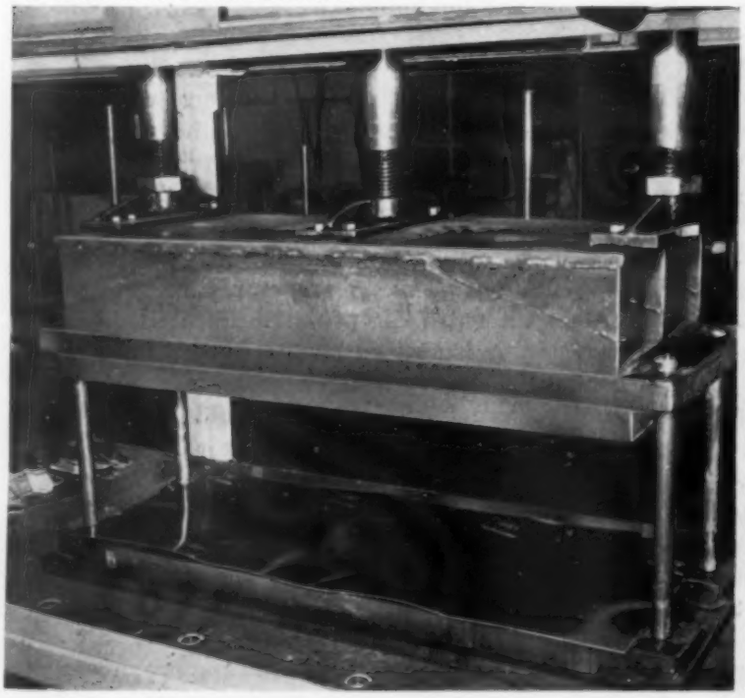


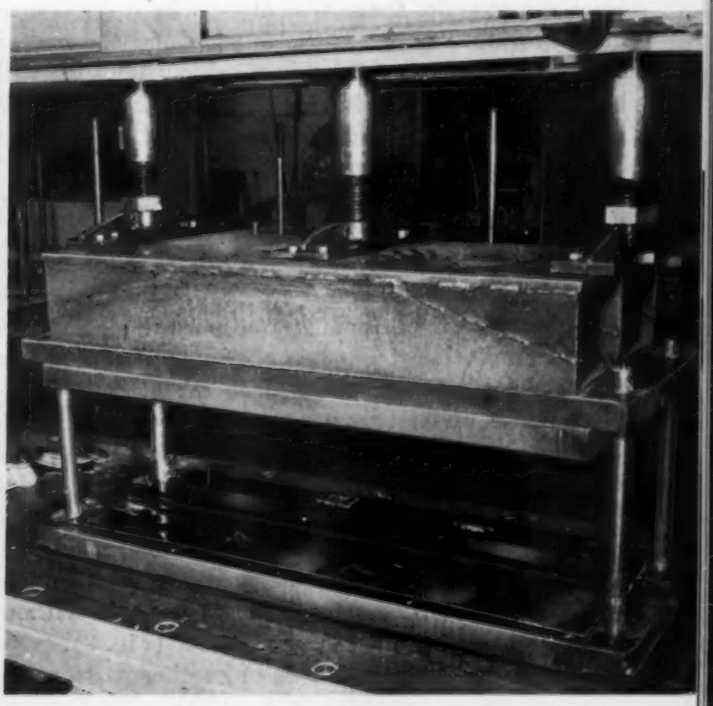
3—Simple bending dies can be used for forming simple parts. Such dies can be constructed with a vertical movement (at left in drawing at right) or a hinged movement (illustrated in drawing at far right)

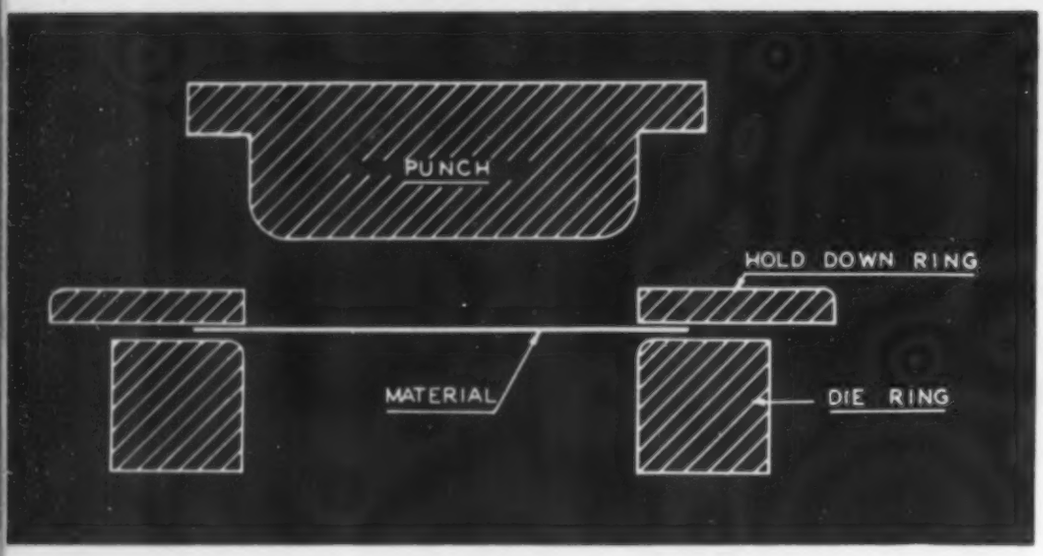
4—Male and female dies are used to form airplane pilot's compartment deck. Heated phenolic sheet is shown in die just prior to forming

5—Pilot's compartment deck formed from preheated phenolic sheet material is shown before being removed from die after forming

PHOTOS COURTESY NORTH AMERICAN AVIATION, INC.







6—Drawing operations require tools similar to those used for drawing metal. Hold-down ring is used to clamp material to female part of die. A positive means of controlling the pressure is also needed

for the article to be formed from a flat sheet will depend upon the article itself. In many cases when strips are to be bent the material may be sheared or sawed to the size required, shearing or sawing several sheets simultaneously. In large production jobs where the number of pieces may run into the thousands, blanking dies of steel may be used. Where large pieces of intricate pattern are needed, routing machines are usually most satisfactory.

In the majority of cases the success or failure in forming depends upon the heating period employed. If the material is left in the oven too long, blistering will occur; should the piece be removed too soon, it will crack when formed.

By actual measurement of the temperatures of the material, using thermocouples embedded between the laminations, it is possible to determine the temperature for the ultimate forming conditions. Because the sheet is heated by an application of heat from the outside, there will always be a difference in temperature between the outside and the center of the sheet. In very thin sheets this difference will be small, but for sheets ⅜ in. thick this difference may be as much as 35 to 55° F.

When the temperature of the sheet reaches 250° F., it begins to soften slightly and continues to soften and become more pliable until it reaches 350 to 355° F., at which point (Fig. 1) it blisters. Little formability exists at 250° F., but this formability increases rapidly until the blistering point is reached. Successful forming therefore depends upon keeping the entire sheet between 250 and 350° F.

The rate of heating must also be considered. If the temperature of the material is raised slowly, the cure of the resin will be advanced. This will dry out the volatiles and leave a material which is too dry and too brittle for forming. Therefore, to form successfully, the center of the sheet must be brought to forming condition as quickly as possible without blistering the surface of the material (Fig. 2).

There are several methods of heating postforming material which can be used satisfactorily. Circulating and non-circulating hot air ovens, molten alloy and salt baths, radiant heat ovens, and contact with a hot plate all have been used successfully. The selection of one in preference to another will depend upon the facilities of the manufacturer. Liquid baths of oil or low melting alloy will produce the most uniform conditions, but some cleaning of the part must be done because particles of metal will cling to cut edges of the blank and eventually damage the mold surface. Where oil is used, degreasing of the part is necessary. Contact with a hot plate depends upon the uniformity of the surfaces to give uniform heating and for this reason is not used extensively. Hot air ovens heated with gas or electrical elements are slower but are normally more adaptable to varied production than liquid or hot plate set-ups. Infra-red heating may be satisfactory especially when a metal diffusion plate is used between the heat source and the laminate.

Forming and cooling

Most formed articles used today can be formed in simple bending dies (Fig. 3) with hinged or vertical movement. More intricate parts require male and female dies, and air or mechanical pressure. (See Figs. 4 and 5.) Drawing operations require tools (Fig. 6) which are similar to those used in drawing metal in that a hold-down plate and a positive means of controlling pressure are needed.

Hardwood or laminated plastic dies (Figs. 7 and 8) are satisfactory except for quantity production (several thousand operations). Combination wood and plastic dies or combinations of wood with metal on the wearing surfaces can be used in quantity production runs. The pressure needed to form a part in which draws are to be encountered will depend to a great extent upon the article being formed, but 50 p.s.i. is usually sufficient.

The part, in most operations, can be left to cool in the forming die. This will require approximately

Drill box manufactured by Cleveland Twist Drill Co., Cleveland, O.; molded by Standard Molding Corp., Dayton, O.

a clear case of good design

▶ Transparent Tenite handsomely displays a set of graduated bit-stock drills for sale. It protects them in transit, and is so light in weight that shipment is economical. And it provides orderly safekeeping of drills for the user. Contents are immediately identifiable through the clear plastic. Tough Tenite easily survives impact and handling. It is impervious to corrosion and mildew, and its lustrous surface is dirt-resistant. Range and beauty of transparent, translucent, and opaque colors make it a sure sales-getter. Other containers of Tenite are fly-rod cases and bait boxes, tubes for blueprints and maps, display boxes fabricated from extruded Tenite sheet. For more information about Tenite, write for a free 32-page illustrated book. TENNESSEE EASTMAN CORPORATION (Subsidiary of Eastman Kodak Company), KINGSPORT, TENNESSEE.

▶ Information regarding Tenite is obtainable through representatives located in Chicago, Cleveland, Dayton, Detroit, Leominster, Mass., Los Angeles, New York, Portland, Ore., Rochester, N. Y., St. Louis, San Francisco, Seattle, and Toronto, Canada; and elsewhere throughout the world from Eastman Kodak Company affiliates and distributors.

TENITE

an Eastman Plastic

1 to 1½ min. for 1/16-in. material. If metal tools are used water may be circulated through the form for greater cooling efficiency. The walls of metal dies can be constructed of thin sections so that ample cooling can be obtained with circulated air. Additional cooling is usually unnecessary with forms of wood, plastic, or composition material.

Enough forms should be provided to allow 3 to 5-min. intervals between the closing of the form and the removal of the formed part. In many instances, it will be possible to remove the part from the form after approximately 30 sec. and transfer it to a cooling frame where the heat can be more freely dissipated into the air. If a short time is allowed for the form to cool, over-heating can usually be avoided. The form can be cooled more rapidly by directing a stream of air over it.

In common with other laminated plastics, postformed laminates are readily machined by standard fabrication methods. This, combined with the ability to incorporate ribbing and stiffening members by drawing or bending, produces a versatility which cannot easily be duplicated by comparable materials.

Postformed laminates cannot be considered as substitutes for metal in the general run of production requirements. The formability is far less than that obtained with the forming grades of aluminum and steel, and the material cost is far greater. This differential must be considered when specifications are being set up for producing an item by postforming.

Applications

Applications of decorative laminates include kitchen work top areas and sink drain-board units, which have been produced in considerable numbers. Baseboard molding and window sills using a ½-in. radius are being manufactured in quantity from black decorative veneer stock.

Raised edge cabinet tops in black and printed designs have been adopted as a standard by one manufacturer of dental office furniture. A table top of similar design is being produced for Pullman diners and club cars in solid colors, inlaid tops, and printed designs.

A manufacturer who is using decorative laminate for the interior lining of taxi cabs employs postformed parts for the treatment of contours. Such applications were formerly limited to flat work, veneered corners or to large radii which could be formed in the cold state. However, decorative laminates are limited to bends in one plane only, which eliminates the use of contours and drawn shapes.

In decorative materials which are intended for use other than veneering to plywood, Masonite which is surfaced with decorative laminates can be used. Parts produced in this manner have excellent dimensional stability and can be bent to radii ranging from 3 to 10 in. by the postforming process. Curved sections, ceiling panels, and corners can be developed with an open backing construction when using this material. Dining car construction has utilized the bulk of this product.

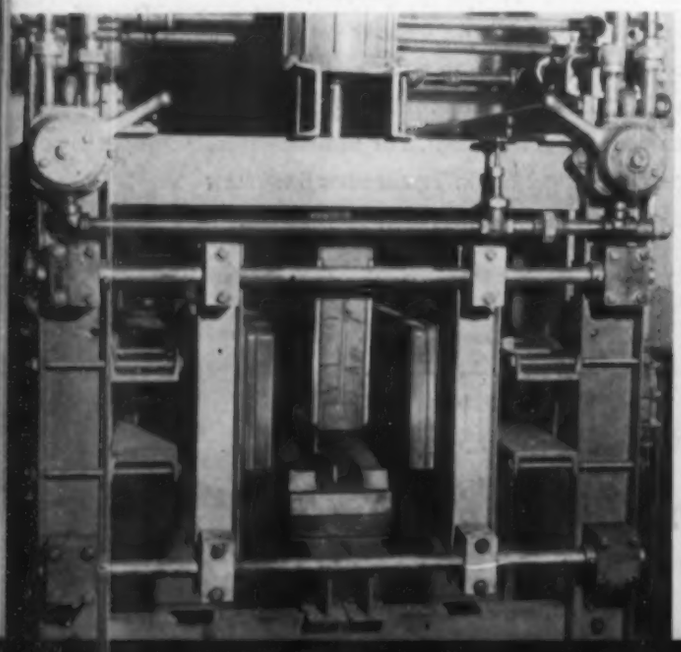
Light weight, chemical inertness, resistance to denting, and ability to be cleaned easily were necessary properties for a material to be used in the construction of carriers and trays for use in handling nylon hosiery. The carriers and trays produced by postforming have materially reduced the number of rejections as a result of picks or contamination.

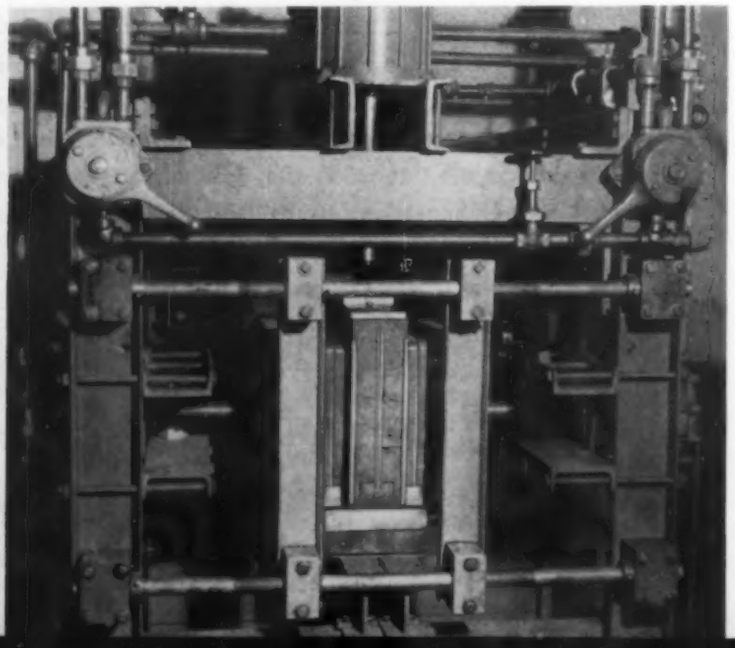
In the manufacture of electrical appliances, the insulation properties, the chemical inertness, the adsorption of vibration, and the light weight of postformed laminates have been utilized.

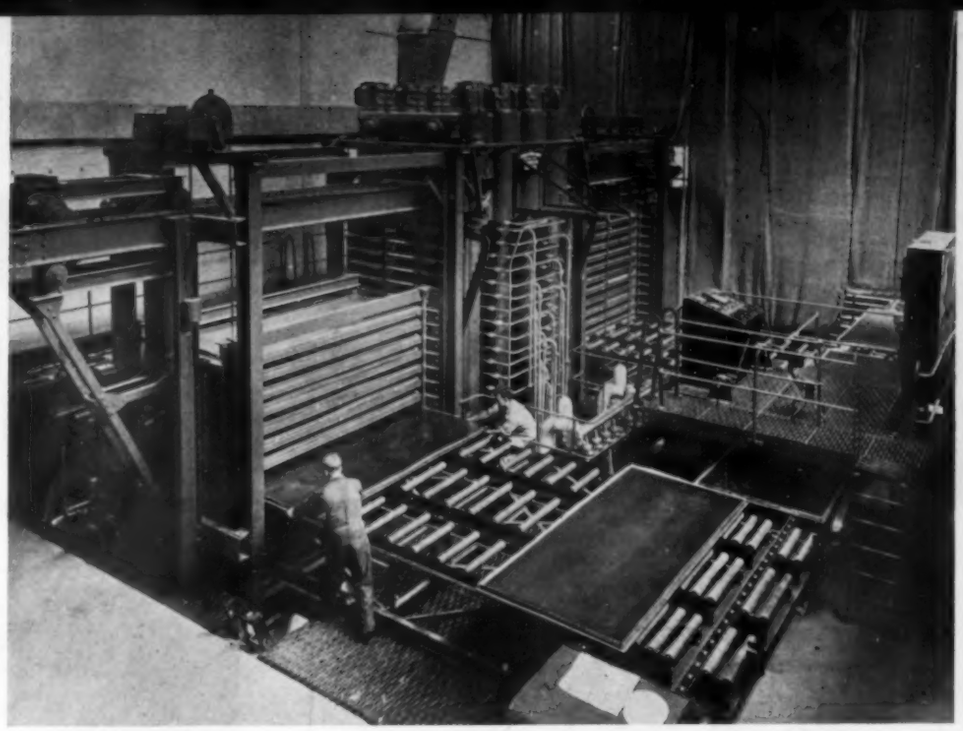
7—Hardwood die used for forming a hosiery carrier is shown in open position. Blank is bent to U shape before insertion

8—Hosiery carrier die is shown in closed position. Center section moves vertically and side sections move horizontally to form carrier

PHOTOS COURTESY FORMICA INSULATION CO.







Press for producing decorative and industrial laminates weighs about 200 tons and exerts a pressure of 5000 tons. Preloaders on either side of press weigh 35 tons each. Press cycle can be controlled by push buttons from central platform

Huge British Laminating Press

THE largest multi-daylight press in Europe has recently been installed and is now in operation at the new Tynemouth (England) plant of De La Rue Insulation Ltd. This press was specially built by John Shaw & Sons (Salford) Ltd., and is currently producing Formica decorative laminates and Delaron industrial laminates.

Apart from its size and power—it weighs some 200 tons excluding pumps and pre-loaders and exerts a total load of 5000 tons—the press has several novel features. It is built up in four sections with two rams to each section. These eight rams, each 18 in. in diameter, have 5 ft. strokes and develop a maximum pressure of 2½ tons p.s.i. The cast steel cylinders and bases each weigh 12¾ tons.

The press heads, in four sections, each weigh 6½ tons, and are of particularly deep section so that there is a deflection of only 0.003 to 0.005 in. under heat and pressure. The eight press columns or tension bolts weigh 5¾ tons each.

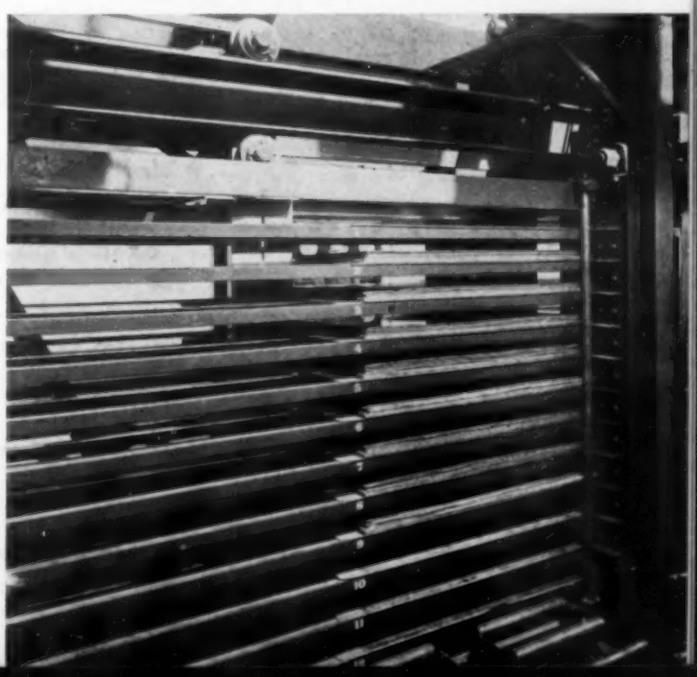
On each side of the press stands a pre-loader weighing another 35 tons. When one charge is in the press the previous charge of finished sheets is being unloaded from the pre-loader at the same time as a new charge of unpressed sheets is being loaded in. There is thus no delay in loading and unloading the press and no waste of valuable press time. Each pre-loader is driven by a 6 hp. motor to push the unpressed sheets in and withdraw the finished sheets from press. Sheets 112 by 52 in. can be handled.

The pumping equipment comprises a 20 hp. low pressure pump together with an air loaded accumulator and an air compressor; for high pressure a 45 hp. pressure fed lubrication reciprocating pump is used together with one of 5 hp., the latter for retaining pressure through the pressure regulating valve.

The whole press cycle can be controlled by push buttons from a platform placed so that a single operator can supervise the complete unit.

Credit for the heating and cooling of the press by a specially designed "Aquatherm" system goes to the Carrier Engineering Co. Ltd. of London and for the control mechanism and record instruments to the Bristol's Instrument Co. Ltd. (London).—*Paul Reilly*

Close-up view of preloader, showing charge of sheets. Six hp. motor moves sheets into press and withdraws laminates



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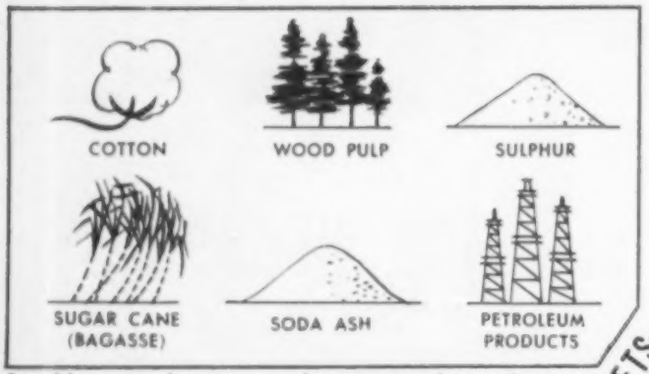

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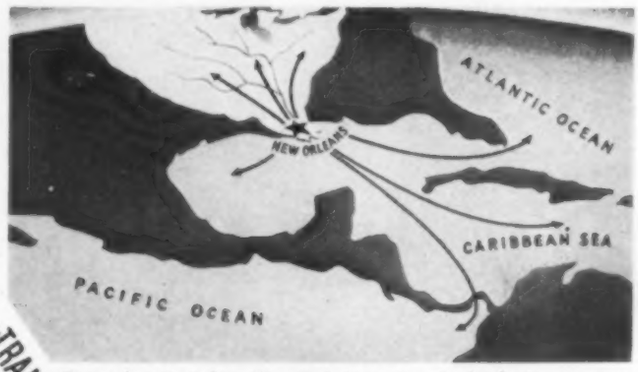

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GREATER NEW ORLEANS

TECHNICAL SECTION

Sawdust-Binder Compositions

by A. E. GABRIEL*

A large number of natural and synthetic resins, some commercial and some prepared at the Forest Products Laboratory, were tried as binders for sawdust and other wood waste in an effort to develop a low pressure molding composition that would be applicable to molding such articles as toys, advertising novelties, and teaching aids. None of the common commercial adhesives were satisfactory, mainly because they shrank so excessively as to cause warpage, or lacked sufficient tack to hold the wood particles together while wet when a practical amount of sawdust (40% or more by weight) was incorporated. These deficiencies were overcome in some instances, but always at a sacrifice of a much lower sawdust-to-binder ratio.

A suitable binder, however, was finally discovered from a class of thermosetting alkyd resins. This resin, diethylene-glycol-maleate polyester, could be set hard by means of a peroxide catalyst and a cobalt drier in a reasonably short time at moderate temperatures. When sawdust was coated with a rubber, this binder could tolerate 50% of wood filler. Mixed with inert inorganic fillers, the polyester could tolerate as much as 75% of filler.

THIS study was prompted by many requests received by the U. S. Forest Products Laboratory for formulas for sawdust-binder compositions for molding miscellaneous articles such as toys, advertising novelties, and teaching aids. In some instances the inquirers wanted to utilize waste wood from their plants; in others, those who had no wood waste problem were seeking a low-cost sawdust plastic to meet their particular urgent needs. The greatest evident need was for a low pressure molding compound that would require only simple processing and molding equipment.

The aim of this investigation, therefore, was to develop a sawdust-binder composition that could be molded at low pressure with or without the application of heat or could be shaped simply by hand and subsequently baked in an oven if necessary. The principal properties sought in such a composition were good tack for holding the wet mixture together, sufficient plasticity for proper flow under slight or moderate pressure, small coefficient of shrinkage while hardening, fairly good mechanical properties in the final product, and reasonable resistance to moisture and heat. In addition, the binder should be capable of tolerating at least 40% sawdust and preferably more, in order to provide a low-cost molding compound.

A large number of natural and synthetic resin glues were tried as binders. None of the ordinary commercial adhesives were satisfactory, mainly because they shrank so excessively as to cause warpage, or lacked sufficient tack to hold the wood particles together while wet. Tack was improved in some cases when a much lower sawdust-to-binder ratio was used.

Adhesives, such as casein, soybean, and polyvinyl alcohol, were tacky enough to permit handling of the wet-molded object; but since in each case the binder did not become rigid until the water it contained was lost, the drying process was always accompanied by appreciable shrinkage. It was concluded from this preliminary work that an adhesive containing water or other volatile solvents in excess of 20 or 25% by weight would, in general, cause serious shrinkage or warpage. This rule would not apply, however, if the solvent were capable of combining with the binder during the curing process, such as in the case of Portland cement (water and cement) or of contact-pressure resins of the copolymer type, such as an unsaturated polyester resin with styrene.

If shrinkage were not a serious objection, these products would be quite satisfactory for certain applications where water resistance is not important. The water sensitivity of these compositions, of course, could be reduced somewhat by the use of water-resistant coatings. The dry strengths of objects molded from compositions containing such proteins as casein or soybean as binders were very satisfactory, as shown in Table I. Sawdust products

*Chemist, Forest Products Laboratory, Forest Service, U. S. Dept. of Agriculture, maintained at Madison 5, Wis., in cooperation with the University of Wisconsin.

containing bentonite, starch, or rosin, on the other hand, were relatively weak. Most of the binders in this class also had a low resistance to heat.

Thermoplastic tacky binders

Among the thermoplastic tacky binder compounds, the one possessing tack properties most like modeling clay was a starch-bentonite-sawdust mixture containing 50% sawdust on a weight-of-solids basis. This mixture (Formula 1)[1] was prepared by dispersing 188 grams of starch (Cassava) in 750 ml. of water containing 5.6 grams of sodium hydroxide in a suitable jacketed dough mixer. To this milky fluid were added 188 grams of bentonite with the mixer running. The bentonite swelled, and after a few minutes the jacketed mixer was heated to process the starch. Then the temperature was raised to a point estimated to be not above 65° C. (149° F.). As the starch hydrolyzed, the mixture became stiffer and changed to straw color. This process required about 20 to 25 minutes. After a little experience it was possible to determine when the starch had been sufficiently hydrolyzed.

When the reaction appeared complete, the mixture was cooled by running cold water through the jacket. To this homogeneous paste 100 grams of aspen groundwood were first added with the mixer still running. Because this groundwood was more fibrous than sawdust, it contributed strength to the final product. Next, 250 grams of sawdust were placed in the mixer. After the mixture appeared to be homogeneous, 20 ml. of castor oil were added and the mixing was continued. The mass was then removed from the mixer and was ready for the next step—molding.

This composition could be stored for days if the moisture was prevented from escaping. It contained about 50% water and 50% solids, and in dried form approximately 50% sawdust and 50% binder. The mixer would not turn over when an attempt was made to make a stiffer dough. The molded object could be dried at room temperature or in the oven at moderate temperatures. Less shrinkage resulted when the objects were dried at room temperature (70 to 80° F.). The properties of the molded product are given in Table I.

Several other thermoplastic binders were tried. Powdered soybean glue was dispersed in water containing hydrated lime and sodium hydroxide to which a small amount of a mixture of carbon tetrachloride, carbon disulfide, and sodium silicate was added (Formula 2), and this mixture was in turn mixed with sawdust. This formulation was not so tacky as Formula 1.

Powdered casein glue and a high-viscosity polyvinyl alcohol resin dispersed in water were also tried as binders (Formulas 3 and 4). The casein system had fair tack. The polyvinyl alcohol system was sufficiently tacky but somewhat rubbery and always gave products, even when dried at low temperatures (100 to 190° F.), that were filled with numerous large and small voids.

The properties of molded objects made from sawdust with these various thermoplastic binders are given in Table I. An intermediate-pressure rosin-starch binder system (Formula 5) is given for comparison. Rosin-starch binders are generally employed with pulp fillers in commercial production of certain toys and novelties. Sawdust was used as the filler in these experiments in order to make a fair comparison to the other formulas containing sawdust. About the same proportions of binder to fiber were used as in the average commercial formulas utilizing this binder. The flexural strength of the mixture was satisfactory, but impact and toughness were low. Wood pulp, having a longer fiber than sawdust, would undoubtedly give better strength properties than those listed in Table I for this compound. Its water resistance, however, is rather poor. Compared to the glycol-maleate resin-sawdust compound, to be described later, the rosin-starch composition fell far short in most of the physical properties.

The worst feature of all of the systems with thermoplastic binders was their water sensitivity, as shown by the data in Table I. The casein plastic (Formula 3) seemed to have somewhat better water resistance than the others. For ordinary indoor uses casein would be satisfactory, but its high degree of shrinkage while drying is a factor that cannot be overlooked for most applications. Soybean has these same disadvantages. Both binders, however, formed very strong bonds with sawdust, as the data for Formulas 2 and 3 in Table I indicate.

The bentonite and polyvinyl alcohol compositions (Formulas 1 and 4, respectively) did not shrink quite so much as the protein-containing compounds, but were much weaker and even more water-sensitive. The starch-bentonite composition had the best cohesive tack for molding of all the thermoplastics tried; yet it formed the weakest bond of all, contrary to the findings with the thermosetting resins. It was obvious that there were other factors besides wet cohesive tack that determined the final strength of the product. The starch-bentonite-sawdust would be applicable only in molding large simple objects containing no delicate parts and which would be used in applications where final dimensions and water-resistance are not critical. Painting or impregnating the surface with phenolic or other synthetic resins would substantially improve the water resistance of this product.

The voids in the polyvinyl alcohol-bonded product (Formula 4) may be mostly responsible for lower flexural and toughness values than would be expected of this resin. Its large coefficient of shrinkage

(*Please turn to page* 200)

[1] Formulas referred to are found in Table I.

Table I.—Composition and Physical Properties of Low Pressure Molded Compounds Compared with Commercial Medium and High Pressure Molded Products

Formula	Composition		Molding pressures	Curing conditions	Specific gravity based on weight and volume ten	Flexural strength (5)	Specific flexural strength (4)	Impact strength Izod (6)	Toughness F.P.L. (6)	Water absorption (7)		Preparation and characteristics
	Ingredients (1)	Proportion (2)								24 hr.	240 hr.	
		percent	p.s.i.			p.s.i.	p.s.i.	ft.-lb. per in. of notch	in.-lb. per in. of width	percent	percent	
					Thermoplastic binder systems							
1	Starch (Cassava) Sodium hydroxide Water Bentonite (powdered) Sawdust (40 to 60 mesh)	12.7 0.4 50.6 12.7 23.6	5–15	Dried 4 days at 40° C.	0.85	610	845			Disintegrated (8)	Disintegrated (8)	Good tack; considerable shrinkage; large and small voids inside specimens.
2	Soybean powder glue Water Hydrated lime (33¼ percent solution) Sodium hydroxide (30 percent solution) Tetrasulfide (50 percent CaI_2 and 50 percent CS_2) Sodium silicate (7 percent) Sawdust (40 to 60 mesh)	16.2 47.0 2.1 4.4 0.3 13.8 16.2	5–25	Baked 3 days at 60° C.	1.04	3452	3189	0.37	1.7	94.1 (9)	Disintegrated partially	A commercial adhesive. Fair tack; considerable shrinkage; small voids inside specimens.
3	Casein powder glue Water Sawdust (40 to 60 mesh)	25.0 50.0 25.0	5–25	Baked 3 days at 60° C.	1.03	3986	3760	0.31	2.2	78.7 (9)	Disintegrated partially	A commercial adhesive. Fair tack; considerable shrinkage; small voids inside specimens.
4	Polyvinyl alcohol Water Sawdust (40 to 60 mesh)	20.0 60.0 20.0	5–25	Baked 2 days at 60° C.	0.53	739	2600	0.17	1.6	Disintegrated (8)	Disintegrated (8)	High viscosity polyvinyl alcohol. Good tack; very stringy; rubbery; appreciable shrinkage; large voids in specimens.
5	Rosin (powdered) Starch (Cassava) Water Sawdust (40 to 60 mesh)	15.0 25.0 20.0 40.0	500	Molded 5 min. at 160° C. (10)	1.15	3700	2800	0.33	0.9	Disintegrated (8)	Disintegrated (8)	Composition resembles an average commercial sawdust-rosin compound used in molding toys, novelties, and the like. Breathing necessary every 30 sec. during molding. Moisture required for good flow. Poor tack.
					Thermosetting binder systems							
6	Phenol-formaldehyde resin Catalyst Sawdust (40 to 60 mesh)	45.5 4.5 50.0	5–25	Baked 4 hr. at 80° C.	0.64	501	1230	0.12	4.2	58.0	64.4	Liquid phenol resin containing 76 percent solids by weight. Very poor tack; no shrinkage; porous.
7	Diethylene glycol maleate Precipitated benzoyl peroxide Sawdust (40 to 60 mesh)	55.5 4.5 40.0	5–15	Baked 8 hr. at 80° C.	0.97	2648	2818	0.28	2.1	4.7	11.9	Resin prepared at the Forest Products Laboratory; taffy-like consistency and acid number of 36. Good tack and no shrinkage.
8	Diethylene glycol maleate Precipitated benzoyl peroxide Sawdust (40 to 60 mesh)	46.3 3.7 50.0	5–25	Baked 8 hr. at 80° C.	0.81	241	368	0.21	0.9			Same resin as used in Formula 7. Poor tack; no shrinkage; slightly porous.
9	Diethylene glycol maleate Precipitated benzoyl peroxide Sawdust (40 to 60 mesh) (rubber coated—contains 10 percent solid rubber)	50.0 4.0 46.0	5–15	Baked 8 hr. at 80° C.	1.05	5140	4890	0.45	4.1	2.6	9.5	Same resin as used in Formula 7. Sawdust impregnated with benzene solution of natural latex rubber and dried at room temperature before mixing with binder. Excellent tack and no shrinkage.
10	Diethylene glycol maleate Lauryl peroxide Cobalt drier Sawdust (40 to 60 mesh)	54.5 4.0 1.5 40.0	5–15	Baked 8 hr. at 80° C.	0.95							Same resin as used in Formula 7. Cobalt drier is 2 percent cobalt naphthenate in styrene monomer. Lauryl peroxide tended to sweat out during baking, causing uneven curing. Good tack.
11	Diethylene glycol maleate Turpentine Precipitated benzoyl peroxide Black walnut shell flour (20 to 40 mesh)	34.0 3.4 3.4 59.2	5–15	Baked 8 hr. at 80° C.	1.05							Same resin as used in Formula 7. Turpentine dissolved in resin at 90 to 100° C. Cooled before adding catalyst. Good tack.
12	Diethylene glycol maleate Precipitated benzoyl peroxide Cobalt drier Sawdust (40 to 60 mesh)	55.0 4.0 1.0 39.6	5–15	Baked 8 hr. at 80° C.	0.99	3134	3195			5.1	13.2	Same resin as used in Formula 7 and same drier as in Formula 10. Good tack.
13	Phenol-formaldehyde resin Glyceryl phthalate Turpentine Catalyst Sawdust (40 to 60 mesh)	36.4 18.2 5.4 3.6 36.4	5–25	Baked 4 hr. at 80° C.	1.11	6400	5200		2.6	34.5	38.5	Liquid phenol resin containing 76 percent solids by weight. Alkyd resin of acid number 89 prepared at Forest Products Laboratory. Resins mixed together at 100 to 120° C.; cooled before adding acid catalyst. Fair tack; poor plasticity; slight shrinkage; porous.
14	Phenol-formaldehyde resin Glyceryl phthalate Turpentine Catalyst Black walnut shell flour (40 to 80 mesh)	28.8 15.5 6.7 4.5 44.5	5–25	Baked 8 hr. at 80° C.	1.14	4420	3400		1.6	2.2	11.5	Same resins and catalyst as used in Formula 13. Fair to good tack; slight shrinkage.
15	Phenol-formaldehyde resin Diethylene glycol phthalate Turpentine Catalyst Black walnut shell flour (20 to 40 mesh)	22.6 20.2 4.0 3.2 50.0	5–25	Baked 8 hr. at 80° C.	1.12	3880	3100		1.5	2.4	12.4	Same phenol resin and catalyst as used in Formula 13. Alkyd resin of acid number 67. Fair to good tack; no shrinkage.
16	Phenol resin (10) Woodflour	50.0 50.0	2500–4000	Molded 5 min. at 160° C.	1.37	8000	4270	0.35	6.4	0.2	1.0	Standard commercial phenolic molding compound. Poor tack.

(1)—Ingredients were mixed in the order listed.
(2)—Based on weight of solids.
(3)—Specimens approximately ½ in. sq. and 5 in. long were tested over a 4-in. span under center loading. Each value is the average for three to five tests.
(4)—Specific flexural strength equal to flexural strength divided by specific gravity squared. Each value is the average of three to five specimens.
(5)—Each value is the average of two to five specimens.
(6)—Forest Products Laboratory intermediate-capacity toughness machine. Tests made on 0.2-in. thickness over 1½-in. span. Each value is the average of three to six specimens.
(7)—Made on 2-in diameter disks of ¼-in. thickness. Each value is the average of two to three specimens. Unless otherwise indicated there was no appreciable swelling during the immersion period.
(8)—Formulas 4 and 5 disintegrated partially in 3 or 4 hr. and completely in 16 to 18 hours. Formula 1 disintegrated partially in 1 hr. and completely in 6 hours.
(9)—Swelled about 20 percent in thickness in 24 hours.
(10)—An ordinary commercial molding resin in dry powder form. Results are based on average values obtained from the literature with the exception of the toughness value, which was determined at the Laboratory.

Polyamides in Germany: Preparation and Applications*

IGAMID A is the standard 66 type of nylon, i.e., it is made with 1 mol of adipic acid and 1 mol of hexamethylenediamine. The condensation is carried out in two stages. Production of the so-called AH salt is accomplished by bringing a methanol solution of the diamine to reflux and adding a 20% solution of adipic acid in methanol at a rate sufficient to maintain reflux. The snow white AH salt precipitates and is washed with methanol on an Escher-Wyss continuous centrifuge. The mother liquor is distilled to recover the methanol.

The second stage or superpolycondensation is conducted in 2-ton batches in V4A steel autoclaves 1 meter in diameter and 8 meters high with a conical bottom to which the extrusion apparatus is attached. Heating is by means of internal and external steam coils using 60 to 70 atm. steam. A 60% solution of the AH salt in distilled water is prepared under nitrogen containing less than 0.003% oxygen, obtained by distilling all the oxygen and some nitrogen off liquid air in a Linde fractionating unit. Time for charging this solution into the autoclave and bringing it up to a temperature of 275° C. is 3 hours. Steam and moisture removal takes 2.5 hr., followed by a condensation period of 1 hour. Acetic acid was added as a stabilizer, 1.5% for polymer for textile purposes and 0.1 to 0.2% for higher molecular weight polymer for plastics.

The polymer (m.p. 250° C.) is extruded from the autoclave by internal pressure as a ribbon about 10 cm. wide and 2 mm. thick. It drops about 10 in. through air into a water trough where it is chilled. It is then air-blasted to blow off water and passed into a mill of I. G.'s own construction (capacity 1 t./hr.) to produce chips about 5 by 3 mm. The chips are dried in a rotary countercurrent hot air dryer 4 ft. in diameter and 20 ft. long, tipped 5° from end to end and provided with baffles to ensure complete agitation of the polymer chips. The dried chips are blown to storage bins for packing and shipping. Extrusion time for a 2-ton batch is 2 to 4 hours. Polymer for fibers and filaments had a molecular weight of 12,000 to 15,000, for molding compounds and films 15,000 to 18,000.

Igamid B

This polymer is made from caprolactam at Ludwigshafen in the same type of equipment and two-stage process used for preparing Igamid A. The caprolactam as a 60 to 80% solution in water is condensed first at 200° C. to a molecular weight of 5000 and then undergoes superpolycondensation at 270 to 275° C. to a molecular weight of 12,000 (m.p. 220° C.).

A new continuous condensation process to make Igamid B has been developed and used to produce polymer for conversion into staple fiber. The reaction is carried out in an 8 meter long V4A steel tube 250 to 300 mm. in diameter, fitted with six to eight plates or baffles to aid mixing. The tube is heated externally with Dowtherm at 250 to 260° C. and normal pressure. A solution containing 10 to 20% water and 90 to 80% caprolactam is pumped into the top of the completely filled tube at the rate of 12 to 36 kg./hr. It is claimed that oxygen is excluded by evaporation of water and that the use of nitrogen or carbon dioxide is unnecessary. Four percent of AH salt or 5 to 6% of aminocaproic acid based on the weight of caprolactam is added to accelerate the condensation and becomes a part of the finished polymer. Six hours contact time is necessary as a minimum for equilibrium to be attained. A pump removes the polymer from the bottom of the tube to the spinnerets in a molten condition. Two tubes of the above dimensions have been installed at Lichtenburg and Premnitz, respectively, and two smaller ones at Lichtenburg. The polymer is said to be as yet unsuitable for the production of continuous filament, but has been used to make staple fiber, bristles, and film. The method is claimed to be cheaper than the autoclave process.

The B material (caprolactam polymer) had been developed in Germany for spinning into yarn and staple instead of the A material (nylon 66) for various reasons. It uses less phenol than A. The manufacture of the polymer is simpler with regard to equipment, temperature control and exclusion of oxygen, and is adaptable to a continuous process. It is said to be easier to spin and process the yarn; the moisture regain of the B polymer is 3% compared with 4.5% for the A material. It is an I. G. development and hence free from royalty payments. Against these advantages there are certain disadvantages. The equilibrium reaction leaves 10% monomer in the polymer, which makes spinning impossible. The polymer has to be washed in chip form with water at 60 to 70° C. to reduce the monomer content to

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*This report is based on information contained in the following Publication Board reports: PB 949, "Investigation of German plastics plants. Part I," by C. M. Kline, J. H. Rooney, J. W. C. Crawford, T. Love, and F. J. Curtis; PB 1009, "Manufacture of thermoplastics in plants of I. G. Farbenindustrie A. G.," by R. H. Boundy and R. L. Hasche; PB 1341, "Summary of German lacquer resins, solvents and plasticizers," by C. M. Kline. MODERN PLASTICS 23, 157 (Dec. 1945); PB 1342, "Minutes of I. G. Organic Chemicals Conference of 9-22-43 in Frankfurt," translated by C. M. Kline and I. G. Callomon; PB 2437, "Acetylene as the basis of a new industrial chemistry," by W. Reppe, translation by I. G. Callomon and C. M. Kline. MODERN PLASTICS 23, 169 (Feb. 1946); PB 7416, "Synthetic fiber developments in Germany," compiled and edited by L. H. Smith, published by Textile Research Institute, Inc., 10 E. 40th St., New York 16, N. Y. The investigating team was composed of F. S. Brown, R. Hill, O. P. Hoff, G. Loasby, J. B. Orig, J. J. Schilthuis, L. H. Smith, D. Traill, and D. B. Wicker; PB 11407, "Igamid production in Ludwigshafen," by H. Hopff and H. Ufer (in German); PB 12467, "German plastics practices," by J. M. De Bell, W. C. Goggin, and W. E. Gloor, published by De Bell and Richardson, Springfield, Mass.; PB 25853, "Synthesis of intermediates for polyamides on an acetylene basis," by W. Reppe, translation by J. D. Rose; PB 28642, "Investigation of German plastics plants. Part 2," by J. H. Rooney, C. M. Kline, J. W. C. Crawford, T. W. M. Pond, T. Love, and R. H. Richardson; PB 28316, "Plastics in Germany, 1939-1945," by C. M. Kline, MODERN PLASTICS 23, 152 (Oct. 1945); PB 32269, "Polyamide films manufactured by Kalle and Co.; Supplement," by W. Wade; PB 32548, "Polymide films manufactured by Kalle and Co.," by W. Wade.

1.5% and then dried to 3% moisture content. The monomer has to be recovered from the wash liquors. On spinning the monomer content rises again to 4 to 5%, which makes the filaments tacky. This makes it necessary to spin at low humidity which entails extra cost, and the stretched yarn must be washed to remove the monomer and then dried.

New types of nylon polymer

The general trend in new polyamides in Germany was in the direction of plastics, artificial leather and films rather than fibers. All the dicarboxylic acids from 2 to 16 carbon atoms and the corresponding diamines have been systematically examined, working over the ground previously explored by Carothers and his co-workers. The most interesting developments are based upon ketopimelic acid, *p*-phenylene dipropionic acid, tetramethylenediamine, N-methylbis (γ-aminopropyl) amine, and *p,p'*-diaminodicyclohexylmethane, usually as partial components of polyamides.

Ketopimelic acid – This is one of the rare dicarboxylic acids which yield polyamides softening over a considerable temperature (30 to 50°). The salt made by combining it with hexamethylenediamine was used in various proportions with caprolactam and AH salt to make commercial polymers. Igamid 85B (85% caprolactam and 15% ketopimelic-hexamethylenediamine salt) is soluble in glycol ethers and was considered promising for use in lacquers and wood sealers. It behaves like rubber on hot rolls. Igamid 40B (60% caprolactam and 40% KG salt) is still more soluble, but is inclined to be tacky; it is used in lacquers. Igamid 50B is made with 40% caprolactam, 35% AH salt and 25% KH salt. The polyamide made with hexamethylenediamine and ketopimelic acid begins to soften at about 180° C. It has low solubility and is likely to be useful only for plastics. I. G. planned to make tubing of it.

***p*-Phenylene dipropionic acid** – This compound gives a very high softening polyamide with hexamethylenediamine. The polymer made with 10% caprolactam has a softening point of 280 to 290° C.; it is melt-stable at 305 to 310° C. and processed at this temperature. Fibers made with it can be dyed only with acetate dyes.

Tetramethylenediamine — Preparation of polyamides with this diamine was still under exploratory investigation. The preferred composition is 20% caprolactam and 80% adipic-tetramethylenediamine salt, giving a polymer which melts at 250° C. A tenacity of 5.9 g./den. with 27% elongation had been obtained in bristles but not in fibers. The fibers are not so stiff as those made with Igamid A and show better crimping. Moisture take-up is 14 to 15%, compared with 9% for Igamid A and 10% for Igamid B. Dyeing properties are better; it has a fair affinity for vat dyes. Wet strength is poorer and draping qualities are not so good as the standard polymers. The polyamide made with pimelic acid and tetramethylenediamine produces useful bristles and fibers without any outstanding properties. It was used for sutures during the war because of its pliability; shortage of hexamethylenediamine may also have been a factor.

***N*-Methyl-bis (γ-aminopropyl) amine** – This diamine is produced by the addition of 2 mols of acrylonitrile to 1 mol of methylamine, followed by hydrogenation. It gives an interesting polymer with diethyl oxalate; oxalic acid does not condense satisfactorily with it. The polyamide melts at 202° C. and has the acid combining capacity of wool, taking up dyes so quickly that it is necessary to use a retarder.

***p,p'*-Diaminodicyclohexylmethane** – This is said to be the cheapest of the aromatic amines. It is combined with adipic acid to produce a salt which is condensed with equal parts of AH salt and caprolactam to produce Igamid 1C. As a stabilizer 0.2% of acetic acid is added to the reaction mixture. A total of 50 tons of this polyamide had been made. It is of interest for plastics because of its glasslike clarity, practically complete freedom from odor, toughness, and hardness. It has superior solubility to the A and B materials, and films made of it are softer and more resistant to hot water and war gases. Igamid 50 made with 35 parts AH salt, 40 parts caprolactam, 25 parts adipic diaminodicyclohexylmethane salt and 4 parts diethanolamine is useful for lacquer purposes, dissolving in various solvents at temperatures above 50° C. and remaining fluid in solution until cooled to about 25° C. Diaminodicyclohexylmethane when combined with acids as the sole component of polyamides failed to give any products of interest.

Suberic acid — This compound had been experimented with in a small way for fibers. It was reported to be very promising; stability of the polyamide is very good, comparable to the sebacic acid type. It had not been examined for films.

Oxalic acid — Normally oxalic acid does not give useful polyamides, but an interesting polyamide had been made by combining it with $H_2N(CH_2)_3O(CH_2)_4O(CH_2)_3NH_2$, a diamine made by adding 2 mols of acrylonitrile to 1 mol of 1,4-butanediol and reducing. The polyamide melts at 160°C. and gives bristles stable in boiling water. Five kg. had been made experimentally.

Pimelic acid — The polyamide based on this 7-carbon dibasic acid and hexamethylenediamine can be produced satisfactorily without an autoclave, using 1/20th mol of diurethane or diformylhexamethylenediamine as a regulator to avoid loss of

amine. The salt melts at 130° C. and little water is required in the condensation which is finished in the usual way at 260 to 270° C. This polymer spins readily and is said to be superior in this respect to Igamids A and B. It is more stable to heat and gives roughly double the normal spinneret life. It can be drawn to a maximum ratio of 5.3:1. It is said to give higher tenacity than Igamids A and B (7 g./den., 11% elongation; 5.5 g./den., 18% elongation).

Sebacic acid — The polyamide made with this acid and hexamethylenediamine was considered to be of interest for bristles, filter cloths, and films. It was reported to be better suited for films than polyamides made with higher dicarboxylic acids.

Undecanedicarboxylic acid — The polyamide made with this acid and hexamethylenediamine was considered to be slightly superior to the sebacic type for bristles and filter cloths.

Diglycollic acid — The polyamides made with this acid were of interest only for adhesives because of low softening point.

Oxydibutyric acid — This acid has two weaknesses. It tends to break down under polymerization conditions to yield γ-butyrolactone which then acts as a chain terminator. The oxygen bridge in polymers is prone to peroxidation, and stabilizers, e.g., thiophenylamine, are required. The only virtue seen in the oxygen bridge is in the making of soluble copolymers.

Thiodibutyric acid — The sulfur bridge is thermally sensitive and the temperature of condensation must be restricted to 230 to 240° C. The tenacity is lower and the products are of doubtful interest.

Dibutyric acid sulfone — This is even more heat sensitive than thiodibutyric acid and the condensation must not be allowed to exceed 230° C.

***p*-Phenylene diacetic acid** — This acid is less suitable than p-phenylene dipropionic acid because of poor melt stability of the polyamides made with it.

Naphthalene dicarboxylic acids — The polyamides made with these were of no interest.

Hydrazine — This diamine has the disadvantages of pronounced tendency to ring formation, liability to gelling, and poor control over chain termination. The possibility of producing fiber-forming polymers with it has been indicated.

Pentamethylenediamine — This diamine is not so satisfactory as the 4 and 6 carbon diamines because of lower softening point of the polyamides made with it and difficulties encountered due to ring closure during condensation.

1,2-Bis(γ-aminopropoxy) ethane — This compound is made by the reaction of 2 mols of acrylonitrile and 1 mol of ethylene glycol, followed by reduction. The polyamide made with adipic acid gives pliable films.

Diaminodiphenylmethane — This compound did not yield polyamides suitable for making fibers.

Polyamide fibers and bristles

I. G. concentrated their production of polyamide fibers on Perlon L made with the polymer of caprolactam (Igamid B) and to a lesser extent on Perlon T made with adipic acid and hexamethylenediamine (Igamid A). Main production to date has been continuous filament. Future plans were to produce three times as much staple as continuous filament because of the observation that Perlon staple is efficacious in improving the wearing qualities of fabric when blended in small quantities with viscose staple, cotton and wool. The benefits to be gained from staple admixtures were particularly striking in the case of socks for which the wearing life was increased many times by the addition of 20 to 25% Perlon fiber. It was claimed that yarn containing 16% of Perlon staple blended with 84% viscose staple had the same durability as cotton yarn. It was predicted that the blending of 10 to 30% of Perlon staple with other synthetic fiber staples, cotton, wool and silk will be extended to wearing apparel and certain industrial fabrics in the post-war period.

The use of Perlon fibers with other fibers to decrease water absorption and to promote quicker drying has also been tried. It was claimed that bathing suits made from yarns containing 20% Perlon staple and 80% wool were superior to all-wool suits because of greater elasticity, lower water absorption, and quicker drying. Neckties, hosiery, ladies underwear, etc., have been made from Perlon-wool blends.

The principal uses for continuous filament yarn during the war included personnel parachutes and flare chutes. No work had been done on the use of Perlon L for airplane tires until nylon was discovered in the tires of American fighters and bombers. Attempts to use regular Perlon L having a dry tenacity of 4.5 g./den. and a dry elongation of 20 to 21% were not successful because of inflation growth. A yarn having a tenacity of 7 g./den. and elongation of 14 to 16% at break had been developed but was not entirely successful, only 20 tires having been made from it at the close of the war.

Two methods of spinning caprolactam polymer were used,—the conventional "grid" method and a new "band" method. The grid spinning method was reported to be the same as that used by E. I. du Pont de Nemours & Co., Inc., before the war. The indivi-

(*Please turn to page* 216)

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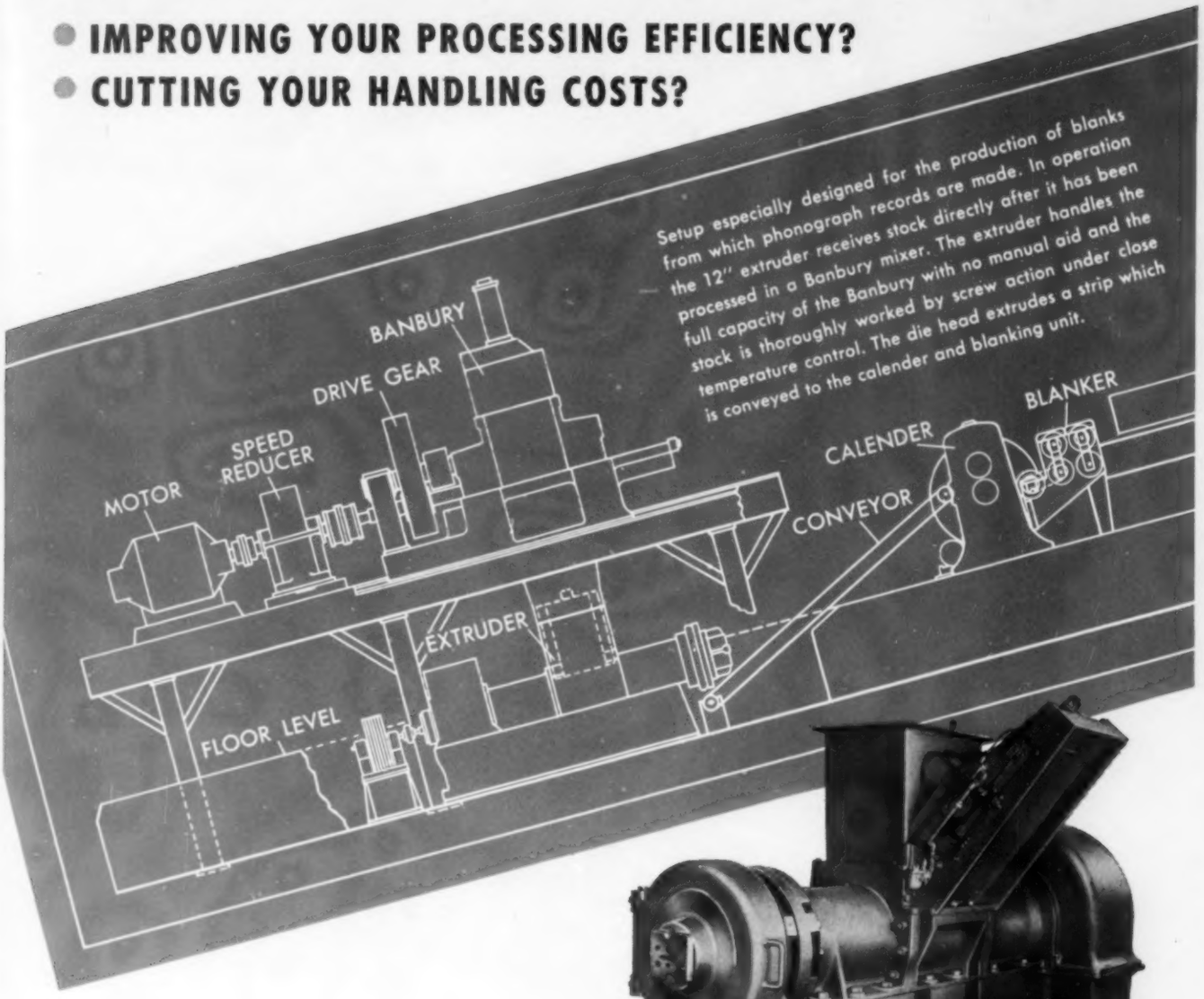

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General

VINYLS PREPARE TO ASCEND. Chem. Ind. *61*, 793-4 (Nov. 1947). The growth of the production of vinyl resins and present factors which may affect future expansion are discussed.

A PLASTIC PRIMER FOR ENGINEERS. K. Rose. Materials & Methods *25*, 119-38 (Apr. 1947). The elementary facts concerning plastics are presented for those who are not concerned with them day by day.

Materials

PROPERTIES OF OLEORESINS, ROSINS, AND TURPENTINES FROM CHEMICALLY STIMULATED SLASH AND LONGLEAF PINES. L. W. Mims and M. C. Schopmeyer. Ind. Eng. Chem. *39*, 1504-6 (Nov. 1947). Applications of 25% sodium hydroxide, 24% hydrochloric acid, and 40 or 60% sulfuric acid to slash and longleaf pines affected few of the characteristics of the rosins and turpentines made from the oleoresins produced by the trees, and the oleoresins were in all cases normal with respect to their rosin and turpentine content.

ALGINIC ACID DIACETATE. N. H. Chamberlain, G. E. Cunningham, and J. B. Speakman. Nature *158*, 553 (1946). The technique of acetylating alginic acid yarns is described.

CORES FOR LAMINATES. British Plastics *19*, 391-3 (Sept. 1947). The continuous production of a core sheet for a sandwich construction is described. The core is made of phenolic resin and sawdust. The face materials may be sheets of metal, wood veneers, paper, or plastics.

ALKOXYAMINOSILANES. C. S. Miner, Jr., L. A. Bryan, R. P. Holysz, Jr., and G. W. Pedlow, Jr. Ind. Eng. Chem. *39*, 1368-71 (Nov. 1947). The preparation and properties of a number of *tert*-alkoxyaminosilanes are described. The major raw materials for the synthesis of many of these compounds are silicon tetrachloride, tertiary alcohols, and ammonia. The aminosilanes hydrolyze readily to give *tert*-alkoxysilanols which change on heating to hydrophobic resinous materials. They react with alcohols to give orthosilicates which are remarkably stable to hydrolysis. These aminosilanes will render water-repellent almost any surface with which they come in contact. A variety of materials, including textiles, paper, ceramics, road aggregate, and silica gel have been successfully treated.

*Reg. U. S. Patent Office.

Molding and fabricating

POLYSTYRENE BOXES. T. C. Willson, Jr. and E. S. Marsh. Modern Packaging *21*, 149-52, 212, 214 (Oct. 1947). A drawing method for forming boxes from oriented polystyrene sheet plastic is described.

AUTOMATIC MACHINING OF PLASTICS. K. Rose. Materials & Methods *25*, 73-6 (May 1947). The techniques for machining plastic laminates are discussed.

Applications

MODERNIZED INTERIOR FOR INDIAN RAILWAY COACHES. Plastics (London) *11*, 532-3 (Oct. 1947). The interior panels and table tops used in the construction of Indian railway cars are made of plastic laminates.

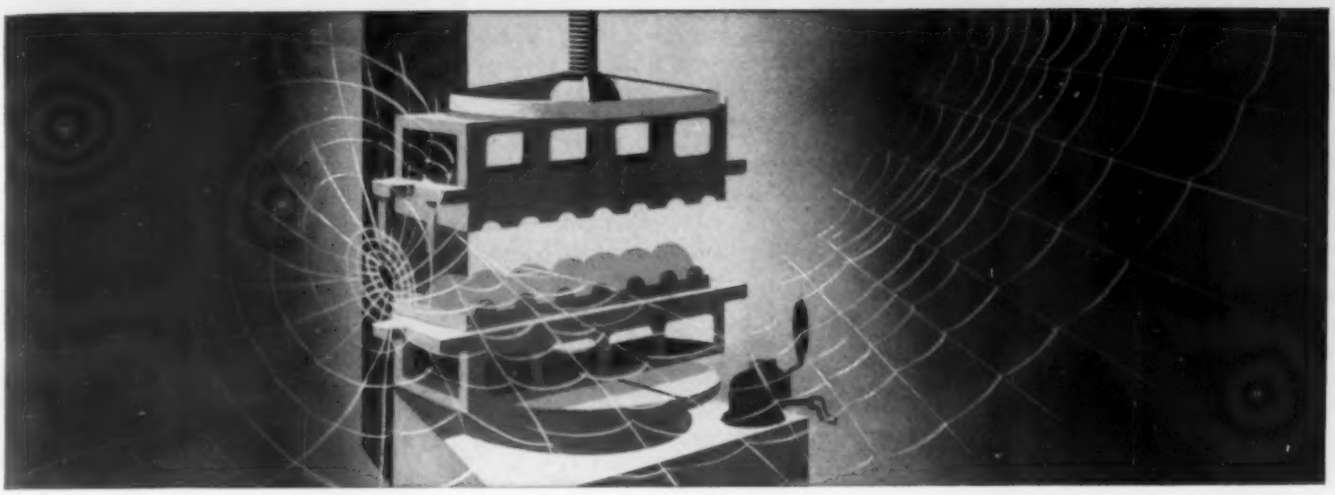
PERFORMANCE OF DEEP ADSORBENT BEDS UNDER NON-EQUILIBRIUM CONDITIONS. G. E. Boyd, L. S. Myers, Jr., and A. W. Adamson. J. Am. Chem. Soc. *69*, 2849-59 (Nov. 1947). This is one of a series of reports on the exchange adsorption of ions from aqueous solutions by organic zeolites. The transfer theory of Anzelius and Schumann is reformulated using a first order rate equation found to apply in the description of the adsorption velocity in single-stage experiments. The dependence of the rate constant on particle size, flow rate, and macro-component concentration is made explicit in this modified theory. In principle, this theory should permit the prediction of the behavior of deep absorbent beds reacting under non-equilibrium conditions to be made in terms of the rate and equilibrium constants for the system. An experimental method for the continuous recording of the concentration history of the effluent from a deep bed is described, utilizing radioactive isotope tracer equipment and its techniques.

EQUILIBRIUM STUDIES OF THE REACTIONS OF RARE EARTH COMPLEXES WITH SYNTHETIC ION EXCHANGE RESINS. E. R. Tompkins and S. W. Mayer. J. Am. Chem. Soc. *69*, 2859-65 (Nov. 1947). Equilibrium studies of the distribution of rare earths between synthetic ion exchange resins and solutions of varying composition were made. For any given composition of solution the distribution coefficient of a rare earth between the two phases did not change as the ratio of the weight of Dowex 50 resin to the solution volume was varied. The exchange reaction between a rare earth ion and the ammonium resin compound followed the relationship predicted by the mass law. The exchange constants for several rare earths, equilibrated with the ammonium compound of Dowex 50 resin, vary. This shows that some separation of rare earths is possible without the use of complexing agents when this resin is employed.

Synthetic Rubber

COPOLYMERS OF BUTADIENE WITH HALOGENATED STYRENES. C. S. Marvel, G. E. Inskeep, R. Deanin, E. A. Juve, C. H. Schroeder, and M. M. Goff. Ind. Eng. Chem. *39*, 1486-90 (Nov. 1947). Some 20 halogenated styrenes were co-polymerized with butadiene in a typical emulsion polymerization formula. Based on laboratory evaluations of small samples, the quality of most of the copolymers was approximately equivalent to that of GR-S. There were indications that the copolymers containing 2,5-dichlorostyrene, 3,4-dichlorostyrene, and *p*-cyanostyrene were superior to GR-S in several respects.

SOLUBILITY, DIFFUSION, AND PERMEATION OF GASES IN GUTTA-PERCHA. G. J. van Amerongen. J. Polymer Sci. *2*, 381-6 (Aug. 1947). The per-



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meability of vulcanized gutta-percha membranes to gases was determined in relation to the rate of diffusion and solubility. The measurements, as functions of temperature, with oxygen, hydrogen, nitrogen and carbon dioxide were taken below and above the melting point of gutta-percha. The evidence is that the rates of permeation and diffusion increase sharply at approximately 45° C., due to melting of the gutta-percha. In the same way, although to a lesser degree, the solubility of the gas likewise increases at the melting point.

Properties

DIFFUSION OF WATER VAPOR THROUGH HIGH POLYMERIC MEMBRANES. A. E. Körvezee and E. A. J. Mol. J. Polymer Sci. *2*, 371-80 (Aug. 1947). Practical, theoretical, and experimental aspects, including sources of error and methods of control, of the water and water vapor permeability of organic membranes are discussed. Determinations of the permeability were made at 25 and 50° C. Data are given for polyethylene, polystyrene, cholorinated polyvinyl chloride, cellulose acetates, a plasticized polyvinyl chloride, and a copolymer of vinylidene chloride and vinyl chloride.

RESISTANCE OF RESIN-IMPREGNATED COTTON FABRICS TO MICROORGANISMS. W. L. White and R. G. H. Siu. Ind. Eng. Chem. *39*, 1628-30 (Dec 1947). Cotton cloths were impregnated with urea-formaldehyde and melamine-formaldehyde resins and subjected to pure culture mildew tests, using Metarrhizium glutinosum and Aspergillus flavipes, and to soil burial tests. Complete resistance to the pure culture mildew tests was exhibited by cloths containing 6.4% Resloom, 5.5% Aerotex, and 5.0% Rhonite resins, respectively. In the more severe soil burial test, cloth impregnated with Aerotex gave the best performance. Whereas the untreated cloth lost all of its strength in less than seven days, an impregnated cloth containing 5.9% Aerotex M-3 retained all of its strength for the duration of the test of 14 days. Although the preliminary experiments presented do not give any indications as to the effectiveness of resin-impregnation relative to other anti-mildewing treatments, they suggest another purpose to which the many varied resin preparations can be directed.

SORPTION OF NITROGEN AND WATER VAPOR ON TEXTILE FIBERS. J. W. Rowen and R. L. Blaine. Ind. Eng. Chem. *39*, 1659-63 (Dec. 1947). Measurements were made of the adsorption of nitrogen and water vapor on six purified textile fibers and titanium dioxide. All the fibers had a relatively low capacity for adsorption of nitrogen as compared with capacity for adsorption of water vapor. The surface area values ranged from 0.31 square meter per gram for nylon to 0.98 square meter per gram for viscose rayon. The values of the free surface energies of adsorption as calculated by the Gibbs adsorption equation were the same for wool, cotton, silk, and rayon fibers but differed for the two synthetic polymers, nylon and acetate rayon.

ULTRAVIOLET ABSORPTION SPECTRA OF SUBSTITUTED VINYL AROMATIC MONOMERS AND POLYMERS. H. A. Laitinen, F. A. Miller, and T. D. Parks. J. Am. Chem. Soc. *69*, 2707-14 (Nov. 1947). The ultraviolet absorption of the monomers and polymers of a number of substituted vinyl aromatic compounds are reported for the range 250-300 mμ. The ultraviolet absorption method was successfully applied to the determination of the monomer ratio in copolymers of butadiene with many of these substituted vinyl aromatic compounds. The relative intensities of absorption for various substituted polystyrenes are compared with predictions based on a theory by Sklar.

Chemistry

KINETICS OF THE EXCHANGE ADSORPTION OF IONS FROM AQUEOUS SOLUTIONS BY ORGANIC ZEOLITES. G. E. Boyd, A. W. Adamson, and L. S. Myers, Jr. J. Am. Chem. Soc. *69*, 2836-48 (Nov. 1947). Equations capable of describing the rate of exchange adsorption of alkali metal cations from aqueous solutions by the resinous zeolite Amberlite IR-1 are formulated on the basis of a diffusion mechanism or according to a bimolecular chemical rate process based on the law of mass action.

PREPARATION OF HIGH-MOLECULAR-WEIGHT ADDITION POLYMERS. A. I. Goldberg. Ind. Eng. Chem. *39*, 1870-3 (Dec. 1947). High-molecular-weight polymers may be prepared in various ways, such as bulk, solution, suspension, or emulsion polymerization. The equipment depends somewhat on the mode of preparation but is essentially a function of the physical properties of the monomers. Temperature control of polymerization reactions is especially important inasmuch as the average molecular weights, and therefore the physical properties, vary considerably with temperature. Because of the exothermic nature of the reaction, good heat transfer is required, which necessitates adequate agitation. The large number of volatile monomers existing in the gaseous state at the desired polymerization temperatures indicate the need for specialized equipment. Sealed tubes, screw-cap pressure bottles, Coca Cola bottles, autoclaves, etc., require the use of various techniques for agitation and heating. A few types of apparatus used in low pressure (5 to 10 atmospheres) and moderate pressure, up to about 30 atmospheres, are described in some detail. Techniques for handling volatile monomers, isolation of polymers, and low temperature polymerization are briefly discussed.

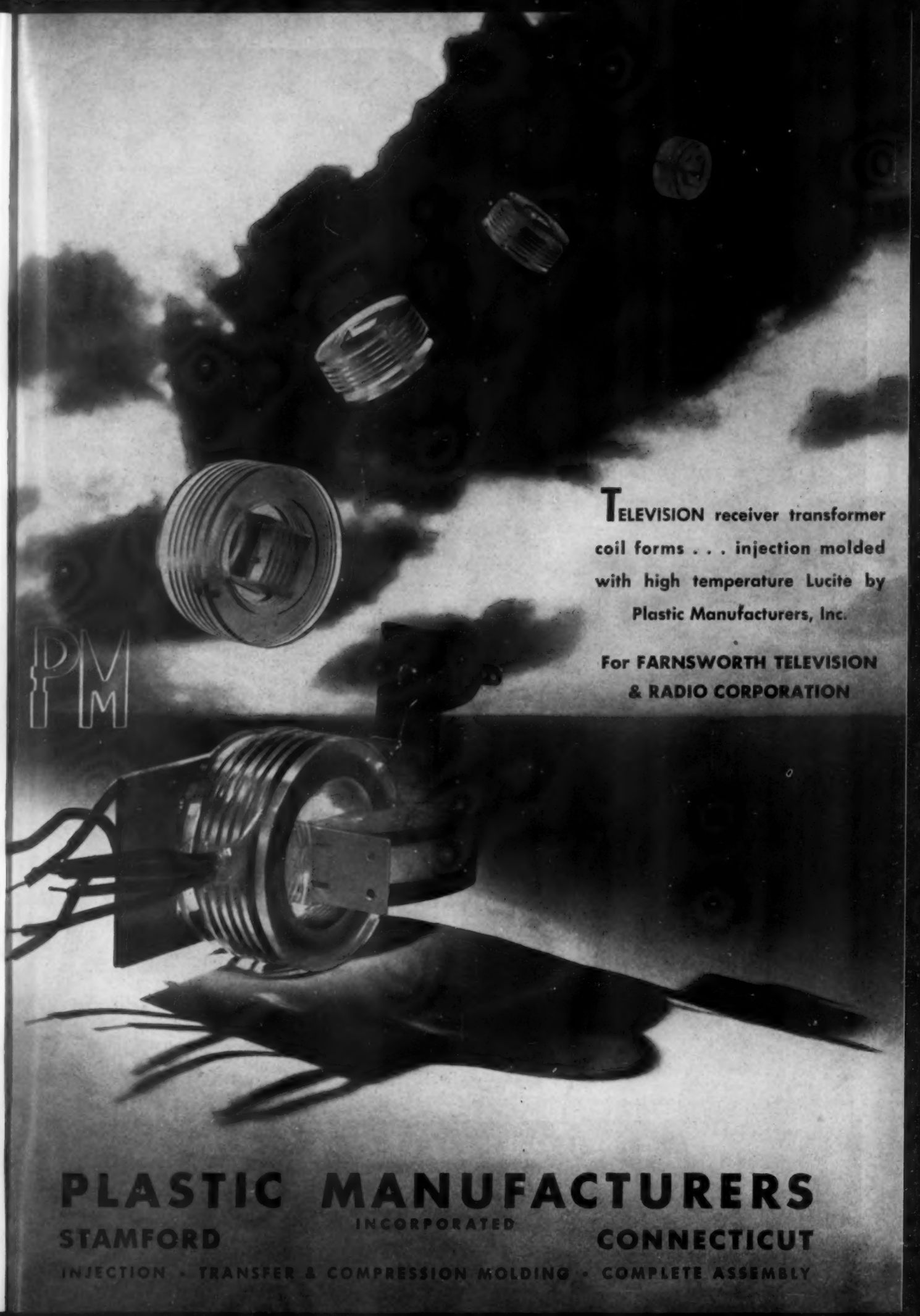
HEATS OF POLYMERIZATION OF ACRYLIC ACID AND DERIVATIVES. A. G. Evans and E. Tyrrall. J. Polymer Sci. *2*, 387-96 (Aug. 1947). The heats of polymerization of acrylic acid, methyl acrylate, methacrylic acid, and methyl methacrylate were measured and found to be 18.5, 20.2, 15.8, and 12.9 kcal/mol, respectively. Values for the heat of polymerization of unstrained polymer molecules were calculated, and the low heat of polymerization of methyl methacrylate is attributed to the presence of steric hindrance in the polymer molecule.

Coatings

COCOON TECHNIQUE. British Plastics *19*, 352a-3 (Aug. 1947); also in Plastics (London) *11*, 462-4 (Sept. 1947). The cocoon process for packaging machinery with a plastic film is described.

SPRAYING OF PLASTICS. Plastics (London) *11*, 511-15 (Oct. 1947). Plastics may be sprayed by means of the Schori gun. The gun and its operation are described. Coatings 0.005 to 0.015 in. may be sprayed in one operation. Powdered plastic materials are used. Suitcases, fuel tanks, condensers, steel rollers, etc., are coated with polyethylene and Thiokol. Any plastic melting under 400° C. may be applied, but these two are particularly suitable for this special purpose.

MATERIALS FOR WIRE-WOUND RESISTORS—SOME RECENT DEVELOPMENTS. E. E. Marbaker. Materials & Methods *25*, 83-8 (May 1947). Silicone coatings have been found to be the most satisfactory for coating wire-wound ceramic resistor tubes.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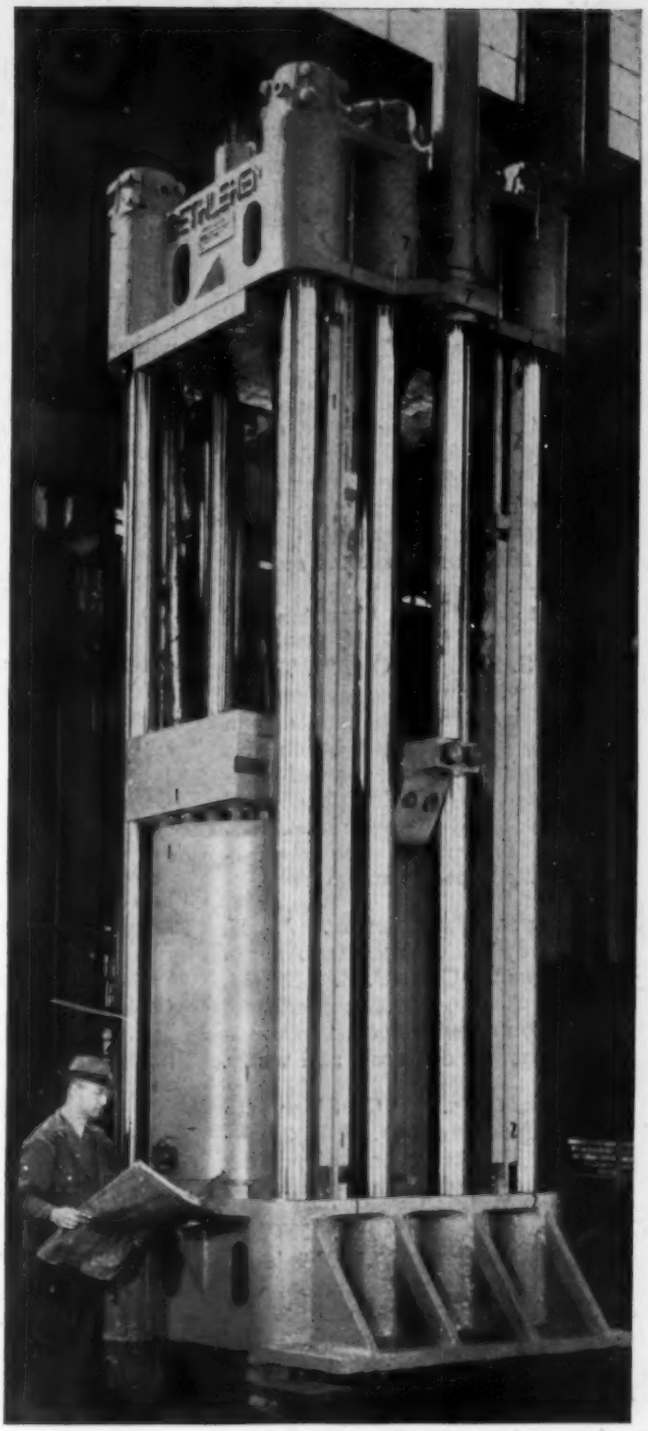

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U.S. PLASTICS PATENTS

Copies of these patents are available from the U. S. Patent Office, Washington, D. C., at 25 cents each

ADHESIVE FILM. P. H. Rhodes (to Koppers Co., Inc.). U. S. 2,429,369, Oct. 21. A heat-reactive adhesive film containing a dry unset dihydroxybenzene-aldehyde condensate, in which the aldehyde is present in less than one molecular proportion, and hexamethylenetetramine in a quantity sufficient to set the resin.

RUBBER BONDING. J. Compton and M. W. Wilson (to B. F. Goodrich Co.). U. S. 2,429,397, Oct. 21. Treating cords with an aqueous dispersion prepared by adding ammonia to a mixture of an aqueous solution of a resin obtained by the partial condensation of a polyhydric phenol and an aldehyde and synthetic latex prepared by the emulsion copolymerization of butadiene-1,3 and styrene.

MEDICINAL PREPARATION. J. K. Dixon and R. L. Morgan (to American Cyanamid Co.). U. S. 2,429,404, Oct. 21. A film-forming medicinal preparation of sulfa drug, triethanolamine, methyl cellulose, and water.

TEXTILE CONE. E. C. Sloan (to Hawley Products Co.). U. S. 2,429,-431, Oct. 21. The process of making resin-impregnated fiber-reinforced plastic textile cones.

FLOOR COVERING. H. A. Reinhardt (to Bigelow-Sanford Carpet Co., Inc.). U. S. 2,429,486, Oct. 21. A needled felt floor covering material is prepared with a thermosetting plastic composition.

AMINE-ALDEHYDE POLYMER. S. S. Kistler (to Norton Co.) U. S. 2,429,-554, October 21. One mol of a primary aromatic amine and at least 1 mol of either formaldehyde or furfuraldehyde is condensed in the presence of at least 1 mol of acid at least as strong as phosphoric acid and reacted by heating with a halogenated paraffin hydrocarbon containing 2 to 20 carbon atoms.

CLOTHESPIN. M. Maccaferri. U. S. 2,429,557, Oct. 21. A plastic clothespin.

ELASTOMER. O. M. Reiff (to Socony-Vacuum Oil Co., Inc.) U. S. 2,429,565, Oct. 21. Reacting 2% of hexamethylenetetramine with a chlorinated petroleum wax subjected to a Friedel-Crafts reaction with an oxyaromatic compound.

POLYMERS. R. C. Morris and J. L. VanWinkle (to Shell Development Co.). U. S. 2,429,582, Oct. 21. Heating a dimethylsulfolene in the presence of a peroxide or molecular oxygen to between 80 and 200° C.

VINYL POLYMER. C. E. Schildknecht (to General Aniline and Film Corp.). U. S. 2,429,587, Oct. 21. A rubbery extensible vulcanization product of a mixture comprising a rubbery extensible vinyl alkyl ether polymer, sulfur, and a diacyl peroxide.

PLASTIC COMPOSITION. J. N. Borglin and A. L. Rummelsburg (to Hercules Powder Co.). U. S. 2,429,603, Oct. 28. A composition comprising a cellulose ether and a small proportion of a substituted terpene as stabilizer.

ESTERIFICATION. W. B. Pratt (to J. G. Denny, Jr.). U. S. 2,429,643-4-5, Oct. 28. An improved process for the acetylation of cellulosic material.

CELLULOSIC FILM. L. W. Georges (to U. S.) U. S. 2,429,679, Oct. 28. Cellulose acetate or ethyl cellulose plasticized with a morpholide of an organic acid such as caprylic, capric, lauric, myristic, or palmitic.

FUEL TANK. W. R. Hoover (to U. S. Rubber Co.). U. S. 2,429,688, Oct. 28. A reservoir for liquid hydrocarbons having a shatter-resistant panel of resin-bonded glass cloth laminate.

SULFUR-FORMALDEHYDE RESIN. J. F. Walker (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,429,859, Oct. 28. Alkali metal polysulfide is reacted with a methylene body such as formaldehyde, paraformaldehyde, or α-polyoxymethylene and then with a polysulfide of carbon dioxide, sulfur dioxide, or sulfuric acid.

COATING. R. G. Woodbridge III (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,429,861, Oct. 28. A liquid solution of polyethylene for hot-dip coating is prepared in a solvent such as an unsaturated hydrocarbon or chlorinated hydrocarbon.

COMPOSITE STRUCTURE. S. G. Saunders and H. Morrison (to Chrysler Corp.) U. S. 2,429,897, Oct. 28. A composite article made with an adhesive consisting of a mixture of water-insoluble hydrolysis-modified polyvinyl acetate resin in which between 14 and 50 mol % of the acetyl groups have been replaced by hydroxyl groups and phenol-formaldehyde resin.

CRINKLED FABRIC. A. S. Jones and G. B. Stackpole (to Cranston Print Works Co.). U. S. 2,429,935, Oct. 28. A crinkled, non-creped cloth is prepared by printing a bleach-processed, warp-wise stretched non-creped cloth with localized areas of a hardenable melamine-formaldehyde resin.

HANDBAG. W. J. Reilly. U. S. 2,429,-962, Oct. 28. A handbag composed of plastic material.

TRANSFERABLE STENCIL. E. C. Bowers (to Minnesota Mining and Mfg. Co.). U. S. 2,429,986, Nov. 4. A stencil film designed for hand-cutting stencil designs for use in forming silk screen stencils made with a water-soluble adhesive coating and a film-forming material such as cellulose nitrate or cellulose acetate lacquer.

SILICONE. D. W. Scott (to General Electric Co.). U. S. 2,430,032, Nov. 4. A soluble dimethyl silicone elastic product prepared by con acting a liquid dimethyl silicone with ferric chloride is added to an agitated two-phase mixture of an aqueous phase and an organic solvent.

MOLDING. T. F. Stacy and M. D. Farmer (to French Oil Mill Machinery Co.). U. S. 2,430,033, Nov. 4. Polyvinyl plastics are hardened by a small amount of a non-gaseous acid material in the mold cavity.

COLLAPSIBLE TUBE. C. Dreyfus. U. S. 2,430,046, Nov. 4. A collapsible tube having a tubular body composed of film-forming material.

ADHESIVE. A. Hershberger (to E. I du Pont de Nemours & Co., Inc.). U. S. 2,430,053, Nov. 4. A composition consisting of 15 parts polyvinyl butyral containing 41.5% butyral

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groups, 15 parts of resorcinol, 30 parts of aqueous 37% formaldehyde, 3 parts of sodium hydroxide, and 185 parts of ethyl alcohol denatured with methyl alcohol.

POLYVINYL ACETALS. L. L. Leach (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,065, Nov. 4. A container for coffee comprising a film of a partial acetal of polyvinyl alcohol.

COPOLYMER. G. F. D'Alelio (to Pro-phy-lac-tic Brush Co.). U. S. 2,430,109, Nov. 4. The solid heat-convertible, fusible polymerizate of a mixture of divinylbenzene and diethyl fumarate.

COPOLYMERS. C. A. Vana (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,313, Nov. 4. Copolymerization of maleic anhydride and a polymerizable monoethylenic hydrocarbon.

POLYVINYL ALCOHOL. G. S. Stamatoff (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,372, Nov. 4. Alcohol-wet polyvinyl alcohol is dried by subjecting to an atmosphere of moist air at a temperature of 90 to 115° C.

SHEET MATERIAL. J. B. Butler, U. S. 2,430,386, Nov. 4. Fibrous sheet material is treated by printing markings on the face thereof and running the material through a polymerizing solution comprising vinyl acetate, toluene and methyl alcohol.

PLASTIC COMPOSITION. C. A. Hochwalt and C. A. Thomas (to Monsanto Chemical Co.). U. S. 2,430,424, Nov. 4. A composition plasticized with a fatty acid ester of styrene glycol.

CONTAINER. R. A. Farrell and C. L. Wagner (to Marathon Corp.). U. S. 2,430,459, Nov. 11. A laminated container having wall portions of heat-sealable sheet.

LAMINATING. B. C. Pratt and H. S. Rothrock (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,-479, Nov. 11. A reaction product of active hydrogen-containing polymeric materials with isocyanate or thioisocyanate compounds.

CUTTER. F. G. Dodge (to Celanese Corp. of America). U. S. 2,430,496, Nov. 11. A heated cutter device for severing a web containing thermoplastic material.

VINYL COMPOSITION. G. J. Esselen and M. H. Gurley, Jr. (to Pro-phy-lac-tic Brush Co.). U. S. 2,430,499, Nov. 11. A filament-forming solution comprising an aqueous solution of polyvinyl alcohol and a small quantity of lauryl pyridinium chloride.

VINYL COPOLYMER. P. L. Gordon (to American Waterproofing Corp.). U. S. 2,430,564, Nov. 11. The copolymerizate of a dialkyl ester of maleic acid and vinyl acetate.

COIN CONDUIT. L. J. Andres. U. S. 2,430,658, Nov. 11. A flexible tubular coin conduit for conducting gravitating coins comprising a helically wound plastic strip material.

POLYMER. G. F. D'Alelio (to General Electric Co.). U. S. 2,430,708, Nov. 11. Resinous reaction product of a chlorinated acetamide, and a product of partial reaction of formaldehyde and a triazine derivative.

COATING. J. A. Mitchell (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,726, Nov. 11. A coating for flexible transparent material comprising a moistureproofing wax and a resinous reaction product of rubber and a phenol.

ADHESIVE. D. V. Redfern (to Adhesive Products Co.). U. S. 2,430,-736, Nov. 11. A thermosetting dry powdered adhesive base, comprising an alkali catalyzed heat condensation product of cresylic acid, furfural, and an alkali-dispersible protein modifier, and an alkali-dispersible protein extender.

POLYAMIDES. T. L. Cairns (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,859-60, Nov. 18. A synthetic polycarbonamide having introlinear carbonamide groups which have extralinearly substituted for hydrogen a mercapto or thio ether radical.

POLYAMIDES. H. D. Foster and A. W. Larchar (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,-866-7, Nov. 18. Preparation of granular N-alkoxymethyl polyamides.

FIBER TREATMENT. C. S. Francis, Jr. (to American Viscose Corp.). U. S. 2,430,868, Nov. 18. Preparation of a thick, low-density, textile felt by treatment of thermoplastic fibers with steam.

POLYAMIDES. T. L. Cairns (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,907-8, Nov. 18. A nitrogen-substituted polyamide containing substituted carbonamide groups.

POLYAMIDES. W. H. Charch (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,910, Nov. 18. Preparation of N-alkoxymethyl polyamides.

CELLULOSE DERIVATIVES. W. H. Charch and F. B. Cramer (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,911, Nov. 18. Reacting an organic solvent-soluble cellulose derivative having at least one free hydroxyl group per molecule with paraformaldehyde and *p*-toluenesulfonic acid.

POLYVINYL ALCOHOL. C. Dangelmajer (to Resistoflex Corp.). U. S. 2,430,919, Nov. 18. A polyvinyl alcohol composition containing a polyhydric alcohol, plasticizer and tetrahydrofurfuryl alcohol.

JOINING TOOL. F. G. Dodge (to Celanese Corp. of America). U. S. 2,430,920, Nov. 18. A device for uniting fabrics containing thermoplastic.

POLYAMIDES. H. D. Foster and A. W. Larchar (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,-923, Nov. 18. Preparation of N-alkoxymethyl polyamides.

CELLULOSE ESTERS. R. M. Goepp, Jr. (to Atlas Powder Co.). U. S. 2,430,926, Nov. 18. A hexitol ketal of chloroacetone as a plasticizer for a cellulose ester of a straight chain aliphatic acid.

LAMINATED FUEL TANK. A. Hersnberger (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,931, Nov. 18. A container for the storage and shipment of high octane motor fuels comprised of laminated walls consisting of a partial acetal of a polyvinyl alcohol and an aldehyde containing up to 6 carbon atoms, a vulcanizable butadiene copolymer, and a layer of natural gum rubber.

ADHESIVES. F. W. Hoover (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,933, Nov. 18. A laminate using N-alkoxymethyl polyamide.

FLOOR COVERING. J. W. Kemmler and E. R. Erb (to Sloane-Blabon). U. S. 2,430,934, Nov. 18. Floor coverings are prepared by applying oleoresinous decorative material to the surface of a backing, applying a layer of an adhesive containing ester gum, hydrogenated rosin or coumarone resin, affixing thereto polyvinyl chloride sheeting, and applying an adhesive containing methacrylate resin to the latter, placing all components in laminar assembly and subjecting to heat and pressure.

POLYVINYL ALCOHOL. C. A. Porter and R. Fershko (to Resistoflex

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Corp.). U. S. 2,430,949, Nov. 18. A polyvinyl alcohol composition containing as plasticizer, ethanol formamide, and a stabilizer such as formic acid, acetic acid or their esters of glycerol and glycol.

POLYAMIDES. H. S. Rothrock (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,950, Nov. 18. A resin prepared by reacting a synthetic linear polyamide with formaldehyde, an alcohol, and a resin-forming formaldehyde reactive material such as urea, thiourea, melamine, a phenol having at least 3 nuclear hydrogen atoms, casein, zein, soya-bean protein, or a sulfonamide, in the presence of an acid catalyst.

POLYAMIDE FIBERS. A. K. Schneider (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,430,953, Nov. 18. Reacting a synthetic linear polyamide filament with a solution containing formaldehyde, acid, and alcohol.

TILE CEMENT. G. F. Lindner and H. J. Livermore (to Minnesota Mining and Manufacturing Co.). U. S. 2,430,987, Nov. 18. A plastic adhesive composition for securing acoustical tiles.

CONTAINER BODY. W. V. Roos. U. S. 2,430,995, Nov. 18. A container body of thermoplastic material for flashlight cases.

CYCLIZED RUBBER. C. M. Carson (to Wingfoot Corp.). U. S. 2,431,028, Nov. 18. A cyclized rubber composition containing as stabilizer a phenol-formaldehyde condensate with morpholine.

FILMS. H. G. Ingersoll (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,431,042, Nov. 18. A process for obtaining clear films of polyethylene.

FABRIC. O. W. Loudenslager and J. E. Wilson (to Wingfoot Corp.). U. S. 2,431,056, Nov. 18. A light weight gas-impervious laminated composition comprising a continuous sheet of a vinylidene chloride vinyl ester copolymer cemented to a sheet of a linear polyamide by a vinyl chloride adhesive.

VINYL RESIN. G. M. Powell III, and T. E. Mullen (to Carbide and Carbon Chemicals Corp.). U. S. 2,431,078, Nov. 18. A stable fluid suspension of toluene-insoluble vinyl resin in a solvent plasticizer and a mixture of liquid hydrocarbons.

PLASTIC SHEETS. R. S. Ames (to Goodyear Aircraft Corp.). U. S. 2,431,102, Nov. 18. Thermoplastic sheets are formed by a jig capable of rotation by centrifugal apparatus.

CONTAINER CLOSURE. J. L. Golding. U. S. 2,431,114, Nov. 18. A container opening is closed with a heated sheet of thermoplastic material.

LAMINATE. E. L. Vidal and L. J. Marhoefer (to Vidal Corp.). U. S. 2,431,214, Nov. 18. Molding a smooth surfaced unitary laminated shell.

POLYALLYL ALCOHOL. S. A. Ballard (to Shell Development Co.). U. S. 2,431,224, Nov. 18. Hydrolizing a polymerized ester of allyl alcohol with an ortho acid of boron, silicon, aluminum, titanium, tin or germanium.

ION EXCHANGE RESIN. E. L. Holmes (to Permutit Co.). U. S. 2,431,251, Nov. 18. An anion exchange resin is prepared by condensing one part each of urea and paraformaldehyde in water under alkaline conditions to form a water-soluble product, adding 6 parts of aniline hydrochloride dissolved in 10 parts of water, boiling to hydrolyze said product, adding 8 parts of formalin, and drying at 120° C.

CLOSURE. B. R. Billmeyer (to Armstrong Cork Co.). U. S. 2,431,303, Nov. 25. A liner material for sealing strong acid containers, comprising polyisobutylene and vinyl chloride-acetate copolymer or polyvinyl chloride, an inorganic filler and fibers of polystyrene, polyethylene, polyvinylidene chloride or glass.

COPOLYMERS. G. F. D'Alelio (to Pro-phy-lac-tic Brush Co.). U. S. 2,431,373-4, Nov. 25. Heating divinylbenzene in diethyl benzene in the presence of a polymerization catalyst and a monohydric alcohol diester of itaconic acid; heating diallyl maleate and a diester in an inert diluent in the presence of a polymerization catalyst.

DYED MATERIAL. R. W. Jacoby (to Ciba Products Corp.). U. S. 2,431,562, Nov. 25. The fastness of dyed textile material is improved by applying thereto an amino-triazinealdehyde resin.

LIGNOCELLULOSE. G. S. Willey (to U. S. Gypsum Co.). U. S. 2,431,720, Dec. 2. A dense, pressed, decorative lignocellulose product.

FABRIC COATING. G. W. Flanagan (to B. F. Goodrich Co.). U. S. 2,431,745, Dec. 2. A process for coating a fabric with plasticized vinyl resin.

POLYMER SOLUTIONS. W. W. Watkins (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,431,783, Dec. 2. A structure-forming solution comprising a synthetic linear polycarbonamide, a phenol, and an alkaline material.

POLYVINYL BUTYRAL. A. J. Geiges (to Baker Castor Oil Co.). U. S. 2,431,800, Dec. 2. Emulsifying a water-insoluble polyvinyl butyral resin.

COATING. R. G. Kenelly (to Monsanto Chemical Co.). U. S. 2,431,873, Dec. 2. A heat-sealable, non-blocking, thermoplastic web is prepared by applying a coating of silica organosol or silica organo aquasol.

SILICONE POLYMER. R. R. McGregor and E. Leathen (to Corning Glass Works). U. S. 2,431,878, Dec. 2. Adding boric oxide to polymeric dimethyl silicone and polymerizing at between 100 and 250° C.

POLYMERIC PRODUCT. J. G. Cook and R. C. Seymour (to Imperial Chemical Industries, Ltd.). U. S. 2,431,921, Dec. 2. Curing a diisocyanate-modified polymer by heating with benzoyl peroxide at 100 to 150° C.

DYEING. F. B. Moody (to E. I. du Pont de Nemours & Co., Inc.). U. S. 2,431,956, Dec. 2. A process of dyeing an article of acrylonitrile polymer.

POLARIZING ELEMENT. A. Marks, G. Weiss, and A. R. Miller (to A. Marks). U. S. 2,432,113, Dec. 9. A polarizing element is protected by forming a polyvinyl-silicate condensate which prevents contraction of the polarizing agent.

DIISOCYANATE-MODIFIED POLYESTER. W. Furness, L. E. Perrins, and W. F. Smith (to Imperial Chemical Industries Ltd.). U. S. 2,432,148, Dec. 9. Compounding a polyurethane with a thermosetting phenol-formaldehyde condensate.

CELLULOSE ESTERS. C. I. Haney and M. E. Martin (to Celanese Corp. of America). U. S. 2,432,153, Dec. 9. Ripening the ester solution by injecting hot vapors such as steam or lower aliphatic acids.

CROWNER. J. Kantor (to Liquid Carbonic Corp.). U. S. 2,432,163, Dec. 9. Heating element for a bottle crowning machine for applying plastic crowns having a downturned annular flange.

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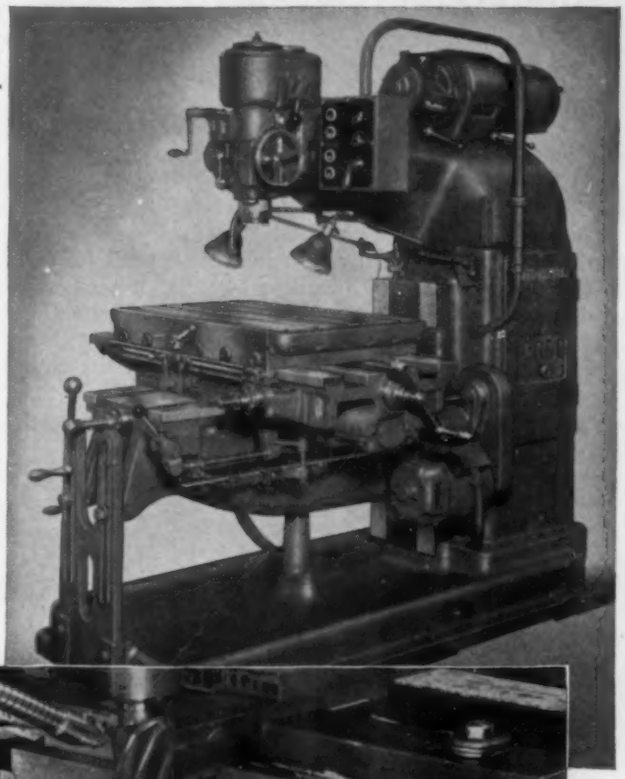

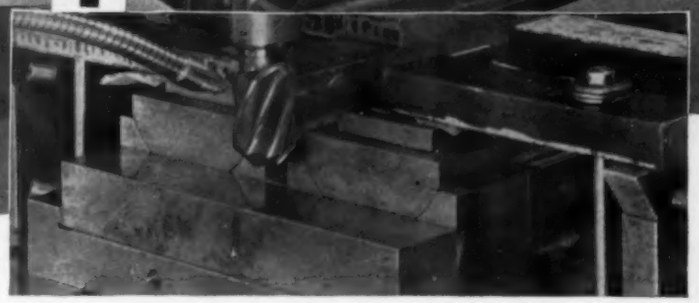

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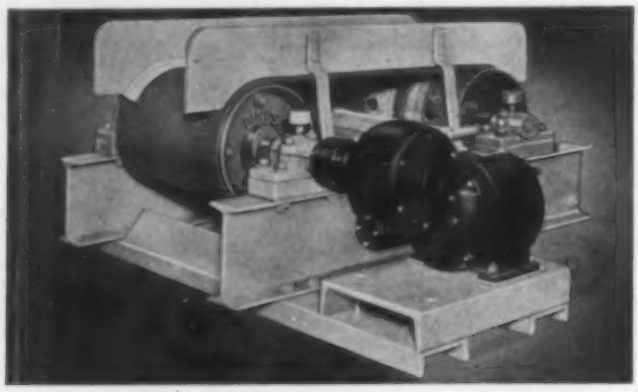


drive. These separators are designed to remove automatically tramp iron from such materials as plastics, coal, chemicals, rubber, etc. They may be installed at the discharge of chutes, hoppers, and conveyor belts or may be fed by hand or by various material handling devices. Belts of any desired length in widths ranging from 12 to 60 in. are available. The Perma-Pulley diameters range from 12 to 30 in. standard.

Slitting saw — Reltool Corp., Seventh and Michigan Sts., Milwaukee, Wis., has developed a line of slitting saws designed to cut plastics without overheating or galling. These saws are hollow ground with a deep dish clearance on the sides to eliminate friction, reduce galling, and generate less heat. In order to assure free cutting and easy elimination of chips, teeth are ground with alternate right and left hand pitch with extra clearance on ground lands.

Built-in water cooler — Plasti-Cast Control Co., 22 S. Parkwood Ave., Pasadena 8, Calif., has recently announced a self-contained unit for supplying a source of thermostatically controlled chilled water for the quick chilling of heavy section thermoplastic molded parts. This unit is complete with a large stainless steel tank and heat exchanger recessed in a 34 by 96-in. hardwood table top. A cover is provided for the heat exchange so that when it is not in use, the full surface of the table can be utilized. The unit operates on a standard 110-volt circuit and is set to maintain a uniform water temperature of between 36 and 30° F.

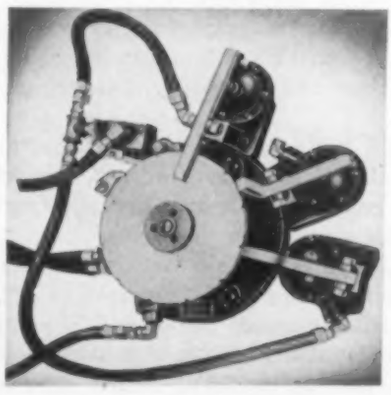
Hand files — Severance Tool Industries Inc., 638 Iowa St., Saginaw, Mich., has announced a new hand file of cemented carbide available with either 20 or 30 ground teeth per inch and in ¾ or 1¼ in. widths. The file consists of a combination handle-holder on which are mounted in tandem two carbide segments. According to the company, the file can cut steels up to Rockwell 62-C. This permits removal of burrs from steel parts at carbide turning speeds and avoids time lost by speed-changing. The segments themselves may be returned to the company for regrinding.

Interval timer — Electronic Timer Series 30 which is designed for machinery and process control and has a range of from 0.03 sec. to 4 min. has been introduced by Photoswitch Inc., 77 Broadway, Cambridge 42, Mass. It is recommended for control of such equipment as hydraulic presses, spot welders, grinders, conveyors, and drilling machines. The timer has a repeat cycle accuracy of 2 percent. The basic circuit is designed so that it is self-compensating for changes in line voltage. A bulletin, PC478, describing the timer is available upon request.

Foot switch — Black & Webster, Inc., 126 Massachusetts Ave., Boston, Mass., is now offering a foot switch designed to cut down operator fatigue. This switch, Model SA, has its pivot located under the arch of the foot so that it operates with a rocking motion. It weighs 2¼ lb. and measures 9 in. long, 3½ in. wide and 2½ in. high.

Industrial humidifier—Abbeon Supply Co., 58-10 41st Drive., Woodside, N. Y., distributors for the Walton Laboratories, Inc., announces a new improved Walton industrial humidifier. In this new model, the lower pan is completely covered and the air brought in from the bottom through a fiber glass filter. This is calculated to save 90% of the cleaning time. To install, the humidifier is hung from the ceiling by accompanying brackets and a single water pipe run to the unit. No return water line is needed. Automatic controls for close regulation of percentages of relative humidity are supplied. The unit has a vaporization capacity of over 1 gal. per hr. and a ball bearing motor drawing less than 100 watts per unit. Directional domes are available.

Dial feed table and accessories — The A. K. Allen Co., 3011 Ft. Hamilton Parkway, Brooklyn 18, N. Y., has introduced four models of a dial feed table and five accessories to facilitate use on punch presses, drill presses or production millers. The table operates by means of compressed air through a three-way air valve, moving a hardened and lapped piston to operate the pawl arm. Models 725A and 725B of the dial feed table have 7¼-in. diameter index plates, 9-in. diameter bases and a distance of 2 15/16 in. from base to top of index plate. Models 11A and 11B have 11-in. diameter index plates, 14-in. diameter bases and a distance of 4 in, from base to top of index plate. Special index plates with from 8 to 40 notches are available for all models; 12 positions are standard. The two B models are adaptations of the A models wherein a special control valve is incorporated so that the plate is automatically self-indexing.



Accessories are: a knockout, C-3, for ejecting a piece

part from the table upward into a deflector or "leadway" chute; a side clamp, C2, for use with long work pieces; a hold down, C-1, for holding down and preventing rotation of parts on which drilling, tapping, spinning operations are to be performed; a two-way valve, V-2, for converting an A model to a B model; a three-way valve, V-3, for operating the knockout, side clamp and hold down.

Clamp — The Pneumatic Jig-Vise, a clamp for repetitive work to be drilled, filed, ground, polished, or assembled, has been announced by the Deublin Co., Northbrook, Ill. Because of the open front design, work may be set or removed from any of the sides of the unit.

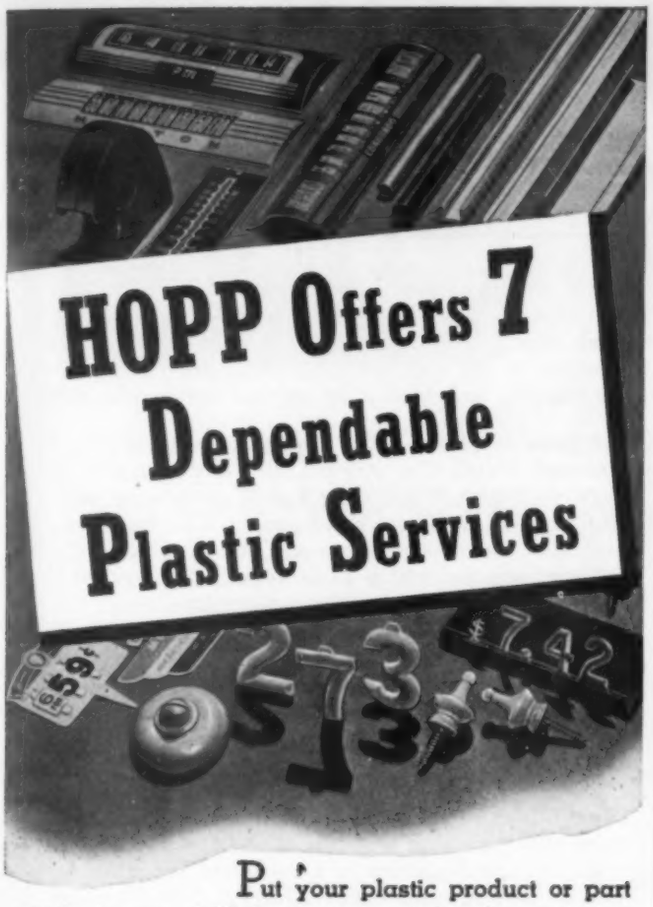
A double acting air cylinder, with a 1-in. stroke, requires only one air line for positive power in either direction. By adding a valve to the air line, clamping pressure can be adjusted from 0 to 10 times line pressure, thereby enabling the Jig-Vise to handle work of heavy sectioned material as well as thin walled plastics. More clamping and nesting plates are available.

Melter — An electric thermostat controlled melter for the company's flexible mold material Plastiflex has been developed by the Calresin Corp., Culver City, Calif. It has a temperature range from 0 to 550° F. The thermostat can be turned back to 150° and the melting pot then used as an oven to cure Plastitool setting in the mold.

Saw band — A spiral saw band which gives a 360° cutting edge has been developed by the DoAll Co., Des Plaines, Ill., for use on plastics, wood, and other light material. Small bandsaws equipped with this band can now take over a range of cutting jobs. The spiral blade permits cutting of material in any direction and the special saw guides keep the blade in alignment. It is available in two sizes — 0.040 diameter and 0.074 diameter and 0.74 diameter with a 15-tooth pitch.

Die inserts—New Method Steel Stamps, Inc., 147 Jos. Campau, Detroit 7, Mich., is now offering die inserts for marking or decorating parts produced by injection molding and die casting. Incorporation in die assemblies of part numbers, lettering, numerals, trade marks, diagrams, instructions, or ornamental designs on both plastic and metal parts, is possible through the use of these inserts. A pantographic method of engraving is employed to produce the lettering.

Truck—A new 4000-lb. capacity Worksaver for handling heavy dies and molds has been announced by the Philadelphia Div., Yale & Towne Mfg. Co., 4530 Tacony St., Philadelphia 24, Pa. This electric "walkie" features a three section roller platform, a rachet-actuated cable and sheave self-loading arrangement, and a high lift mechanism.



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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery

"Frontiers in Chemistry, Vol. V: Chemical Architecture," edited by R. E. Burk and Oliver Grummitt.

Published by Interscience Publishers, Inc., 215 Fourth Ave., New York 3, N. Y. Price $4.80. 202 pages.

Six lectures are presented in this fifth volume in a series on advances in the field of chemistry. Discussed are applications of molecular geometry in the field of reaction mechanism; dipole moment, resonance, and molecular structure; coordination compounds, X-ray studies of randomness; light scattering in polymer solutions; and inorganic gels.

"Plastics Dictionary," by Thomas A. Dickinson.

Published by the Pitman Publishing Corp., 2 W. 45th St., New York 19, N. Y. Price $5.00. 312 pages.

Approximately 3500 of the most common terms used in the plastics industry are defined. Trade names used in the United States and Great Britain are included. Supplementing the definitions are tables and charts giving data on catalysts, chemical elements, fillers, pigments, plasticizers, solvents, etc.

"Industrial Weighing," by Douglas M. Considine.

Published by Reinhold Publishing Corp., 330 W. 42nd St., New York 18, N. Y. Price $10.00. 853 pages.

Scale design, construction, and operation are discussed in the first part of this book; the use of scales in such industries as plastics, rubber, textile, food, chemical, mining, and metal is reviewed in part two. As the book is intended for users of scales, a glossary of scale terms is included.

"Best's Safety Directory," Second Annual Edition.

Published by Alfred M. Best Co., Inc., 75 Fulton St., New York 7, N. Y. Price $5.00. 494 pages.

Profusely illustrated, this safety directory shows what safety products or devices to use for specific hazards, how to use them, and where to get them. Safety devices for fire protection, personal protection, personal hygiene, plant maintenance and sanitation, above ground protection, liquid and solid materials handling, atmosphere control, machinery guarding and control, and training and warning aids are described.

"Tool Steel Simplified," by Frank R. Palmer and George V. Luerssen.

Published by the Carpenter Steel Co., Reading, Pa. Price $2.00.564 pages.

This revised edition of "Tool Steel Simplified" by Frank R. Palmer and George V. Luerssen, vice-president and chief metallurgist, respectively, of the Carpenter Steel Co., has been brought up-to-date by the addition of many new methods, new materials and new principles that were learned during the past 10 years. The additions include such subjects as the newer conceptions of hardenability, the latest advances of heat treating equipment, methods and testing, the newest hardenability tests as well as the latest information on atmosphere control and quenching methods. Three completely new chapters are 1) Tool Steel Selector, 2) Time Required to Heat Tool Steel, and 3) A Treatise on High Speed and Hot Work Steels. There is no question but that this book is of vast importance to all users of tool steel inasmuch as it contains complete and concise answers to the questions—which is the right tool steel for this job, and what is its correct heat treatment?

Synthetic sapphire — The Sapphire Products Div., Elgin National Watch Co., Aurora, Ill., has issued a seven-page pamphlet, "Why Sapphire," explaining the uses and properties of synthetic sapphire in industry. The pamphlet includes reprints and condensations of authoritative articles which have appeared in recent trade, industrial, and management publications.

Special handling devices — A colorful 40-page catalog issued by Tructractor Div., Clark Equipment Co., Battle Creek, Mich., describes Clark's full line of machines and special handling attachments. All the equipment is attractively illustrated.

Mold alloys — Information on the use of low temperature non-shrinking bismuth alloys and methods of application are discussed in a five-page brochure entitled "Mold Making with Cerro-Alloys." This brochure, released by the Cerro de Pasco Copper Corp., 40 Wall St., New York 5, N. Y., describes step by step the spraying and casting of cerro alloy molds, as well as the equipment and supplies necessary for simple and inexpensive operation.

Tensile strength tester — The Thwing-Albert Instrument Co., Penn St., and Pulaski Ave., Philadelphia 44, Pa., has just released booklet P-478 describing the company's electro-hydraulic tensile strength tester. Included is a brief historical background, breakdown of the instrument into component parts, diagrams and pictures, operational details, accessory items, and a description of models and ranges available.

Fabricating cellulose acetate — An 11-page booklet on the methods for fabricating cellulose acetate plastic materials has just been released by the Plastics Div., Monsanto Chemical Co., P. O. Box 1531, Springfield 2, Mass. This Production Information Bulletin No. 50, entitled "Fabricating Fibestos and Vuepak," describes and illustrates step by step methods used in making such items as blown toys, plastic covered wood heels, novelties, toothbrushes, and hairbrushes.

Industrial seating — A complete seating analysis for industrial uses — ranging from chairs and stools for press operators and sewing machine operators to plant cafeteria, office, and first aid room furniture — is presented in Catalog No. 48 released by Royal Metal Mfg. Co., 175 N. Michigan Ave., Chicago 1, Ill. Also included is an analysis of factory seating, which stresses the importance of proper seating for achieving top production.

Lupomatic tumbling barrel — Five new two-page bulletins have been issued by Lupomatic Industries, Inc., 4510 Bullard Ave., New York 66, N. Y., four of which illustrate and describe tumbling barrels of several types

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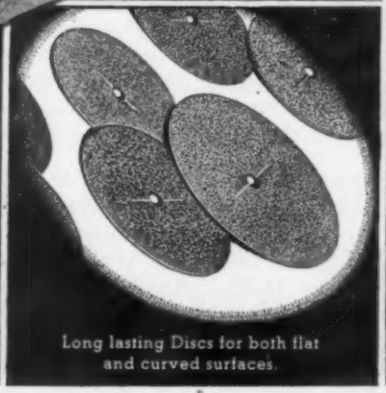

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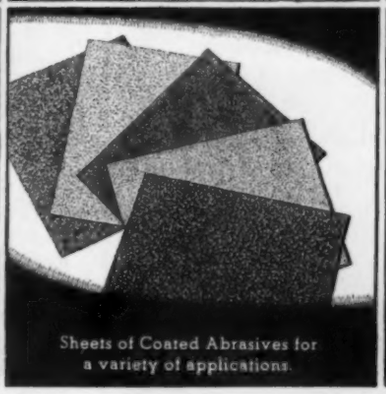

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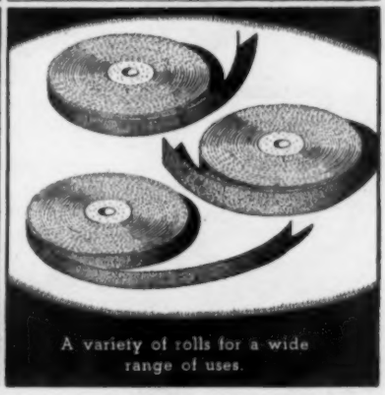


A variety of rolls for a wide range of uses.

for cutting down, deburring, burnishing, and polishing metal and plastic parts. The fifth bulletin gives complete processes and suggestions for proper compounds and carriers to be used under certain conditions of finishing work on metal and plastic parts.

Micromax controllers — The Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia 44, Pa., has just issued a seven-page booklet entitled "Micromax Model C Indication Controllers." The booklet provides a compact guide to all indicating controllers. Illustrations show installation and interior views of these instruments.

Stiffness testing machines — Bulletin 35, a 15-page illustrated booklet entitled "Stiffness Testers," has been issued by the Tinius Olsen Testing Machine Co., 598-C N. 12th St., Philadelphia 23, Pa. Factual data is given on the various types of tests and applications made possible by the use of these machines.

Company report — The Witco Chemical Co., 295 Madison Ave., New York 17, N. Y., has just issued an attractive 26-page booklet describing its activities in the chemical field. Included are pictures of its plants, laboratories, and pilot plant.

Engineering reference data — A 78-page book, "Handbook of Spaulding Plastics and Other Products," has been released by the Spaulding Fibre Co., Inc., 310 Wheeler St., Tonawanda, N. Y. This book, intended for design engineers and buyers of machine parts, presents engineering reference data and suggests uses for the products of the company.

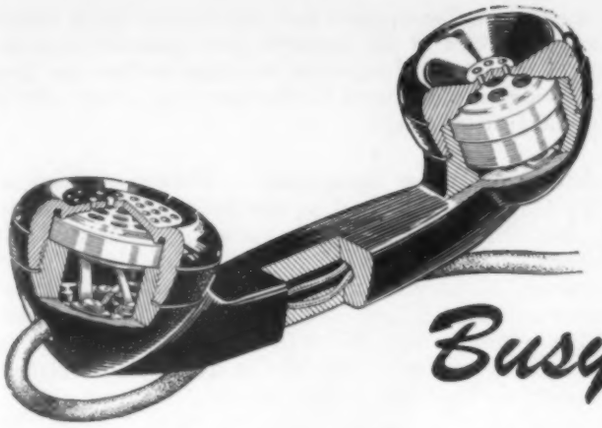
Polariscopes — Apparatus used for obtaining experimental solutions to problems of stress distribution in mechanical parts and structures are discussed in a four-page bulletin, entitled "Photoelasticity Polariscopes," released by the Gaertner Scientific Corp., 1201 Wrightwood Ave., Chicago 14, Ill.

Case hardening mold steel — A brochure released by the Carpenter Steel Co., Reading, Pa., describes Mirro-mold, a new case hardening mold steel expressly designed for making cold-hobbed cavities. The material is a vanadium treated cold melt electric furnace steel, offering advantages of ductility and ease of hobbing.

Hydraulic cylinders — Hydro-Line Mfg. Co., 711 19th St., Rockford, Ill., has just issued a 26-page booklet entitled "Hydro-line Hydraulic Cylinders." The specifications presented are designed to simplify the work of the engineer who has to determine the cylinder type and size best suited for an intended application.

Heat welding plastics — The Industrial Electronics Div., Rediffusion Ltd., Broomhill Rd., Wandsworth, London, S. W. 18, England, has issued a 16-page booklet entitled "Radio-heat Welding of Plastics with the JP.1 Jig Welder." This bulletin gives practical advice and information on the manufacturing methods and procedure for producing a variety of articles on this plastics welder.

Data on mold bases and parts — A 151-page booklet on standard mold bases for plastic and die casting molds and their parts has been issued by the Detroit Mold Engineering Co., Detroit 12, Mich. The booklet illustrates each different D-M-E standard mold base along with a general description of the base, instructions for ordering, price range table, and a complete diagram of the mold base with all the dimensions. Other sections of the booklet illustrate, diagram, and give the price range of



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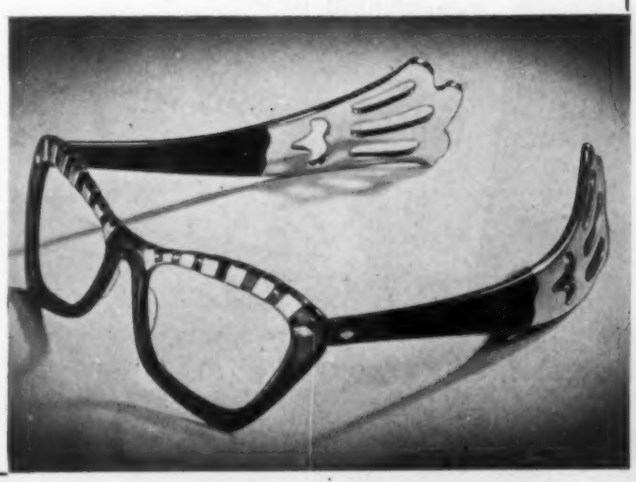

all the standard equipment and parts for the mold bases. Another section of the booklet gives general data on each of the standard injection molding presses that are now being manufactured in this country, along with a table of draft angles.

Moisture measuring equipment — A 28-page booklet (2164-138), just published by the American Instrument Co., Inc., Silver Spring, Md., gives a comprehensive description of a complete line of electric hygrometer equipment suitable for the more exacting industrial and laboratory applications. This illustrated booklet describes a tiny sensing element that responds within a fraction of a second to increases or decreases of relative humidity as small as 0.1 percent.

Weldwood moldings — New weldwood moldings, used in simplifying plywood paneling installations, are described in a brochure issued by the United States Plywood Corp., 55 W. 44th St., New York 18, N. Y.

Extrusion equipment — The National Rubber Machinery Co., 47 West Exchange St., Akron 8, Ohio, has issued a six-page booklet, "Plastics Extrusion Equipment," which describes the company's extruders and auxiliary equipment. The booklet is attractively illustrated.

Properties of Cardolite resins — A new booklet on Cardolite, which is the trade name for a group of resins derived from the liquid in the shell of cashew nuts, has been published by the Irvington Varnish & Insulator Co., Irvington, N. J. The applications are listed for over 40 of these resins in a wide variety of industries. Technical data are given on the properties of the resins.

Scientific publications — A 56-page catalog released by the Elsevier Book Co., Inc., 215 Fourth Ave., New York 3, N. Y., contains titles and descriptions of a large number of books written by prominent scientists throughout the world. The fields covered include chemistry, high polymers, physics, engineering technology, biology, biochemistry, biophysics, and medicine.

Lignin — Bulletin 19, "Lignin Chemistry and Utilization", a report of a conference held at New Haven on September 19th, has just been published by the Northeastern Wood Utilization Council, P. O. Box 1577, New Haven 6, Conn. The bulletin gives the principal papers and discussions of the conference in which about 75 research men from the U. S. and Canada participated. The cost of the bulletin is $2.

Paint and paint materials — "Symposium on Paint and Paint Materials," a 120-page book, has just been released by the American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. This technical symposium was prepared by Committee D-1 on paint, varnish, lacquer and related products, and includes technical papers, discussions, and statistical problems. Copies of this book can be obtained from A.S.T.M headquarters at $2 each.

Adhesive — National Adhesives, 270 Madison Ave., New York 16, N. Y., has just issued a 20-page booklet entitled "How to Use and Prepare Glues, Pastes, and Gums." Information is presented on the storage and handling of all types of adhesives, as well as on recommended methods of removing the contents from various type of containers. Chapters are devoted to the descriptions of such terms as fluidity, viscosity, etc., together with a discussion of some of the basic principals of adhesion.

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Thermex RED HEADS

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Consumption of

IF the January production is any criterion, the 1948 production of plastics raw materials, exclusive of protective coatings, may easily go over the often talked about 1,000,000,000-lb. goal. The 81,000,000-lb. figure in January was not only surprising but was one of the largest months on record. Notable among the individual materials was phenolic molding powder consumption of 18,500,000 pounds. No one would have believed this possible a year ago and the

PLASTICS AND SYNTHETIC RESIN CONSUMPTION
From Statistics Compiled by Bureau of

Materials
Cellulose acetate and mixed ester plastics[a]
Sheets
Continuous (under 0.003 gage)
Continuous (0.003 gage and upward)
All other sheets, rods, and tubes
Molding and extrusion materials
Total
Nitrocellulose plastics[a]
Sheets
Rods and tubes
Total
Other cellulose plastics
Phenolic and other tar acid resins
Laminating (dry basis)
Adhesives (dry basis)
Molding materials[a]
All other, including casting (dry basis)[c]
Total
Urea and melamine resins
Adhesives (dry basis)
Textile and paper treating (dry basis)
All other, including laminating (dry basis)[c,d]
Total
Polystyrene[c,e]
Vinyl resins
Sheeting and film including safety glass sheeting[a]
Textile and paper coating resins (resin content)
Molding and extrusion materials (resin content)
All other including adhesives (resin content)[c]
Total
Miscellaneous resins
Molding materials[c,f]
All other (dry basis)[c,g]
Total
Grand Total

[a] Includes fillers, plasticizers, and extenders. [b] Data cannot be published without disclosing operations of individual establishments. [c] Excludes data for protective coating resins. [d] Excludes urea and melamine molding materials; see footnote [f]. [e] Dry basis, including necessary coloring material.

Plastics Materials

interesting factor is that the molders are still demanding more material. There is no indication yet that supply has caught up with demand. Another interesting item in the January figures was the increase in cellulose acetate and mixed ester plastic molding materials from a low of less than 4,000,000 in December to almost 4,500,000 pounds. Furthermore, ethyl cellulose returned after months of negligible consumption to a sizeable 750,000 pounds.

IN POUNDS FOR 1947, DEC. 1947, JAN. 1948
Census, Industry Division, Chemical Unit

Total for 1947	*December 1947*	*Jan. 1948*
lb.	*lb.*	*lb.*
7,227,370	475,043	365,984
7,843,613	614,081	654,362
3,851,354	254,241	264,850
58,534,379	3,829,623	4,460,908
77,456,716	5,172,988	5,746,104
9,216,859	627,630	582,594
3,668,652	213,928	282,795
12,885,511	841,558	865,389
1,685,554[f]	[g]	746,816
40,546,186	3,513,157	3,421,935
21,069,409	1,920,235	1,950,961
194,315,872	17,160,488	18,522,174
63,445,691	5,067,639	5,560,743
319,377,558	27,661,519	29,455,813
48,454,384	4,210,386	4,596,974
16,862,315	1,634,764	1,684,088
7,785,087	719,421	555,516
73,101,786	6,564,571	6,836,578
94,985,618	11,455,593	10,226,219
66,425,689	8,094,122	7,784,527
17,235,802	2,182,831	2,414,438
73,113,605	7,828,786	7,823,309
27,062,369	2,297,927	1,531,470
183,837,465	20,403,666	19,553,744
56,148,825	4,540,150	4,959,584
29,543,939[h]	2,616,819[h]	2,717,111
85,717,529	7,181,734	7,676,695
849,022,972[h]	79,256,864[h]	81,107,358

[f] Includes data for urea and melamine, acrylic acid, and miscellaneous molding materials. [g] Includes data for petroleum resins, acrylic acid ester resins, mixtures, and miscellaneous synthetic materials. [h] Revised. [i] The total given covers January through April only.

PLASTICS STOCK MOLDS*

A

B

A — Piggy bank, approximately 4¼ in. long by 3 in. high. Molded by halves in eight-cavity mold (making four units) of polystyrene in red, yellow, or pink. Holds over $30 in dimes or $12 in mixed change. All-Plastic Corp., Avon-By-The-Sea, N. J.

B — Key chain and coin-holding tag. Molded from acetate in a variety of colors. Three nickels are held in place by a spring. Sold only with imprint to order. Raycraft Inc., 2108 Payne Ave., Cleveland 14, Ohio.

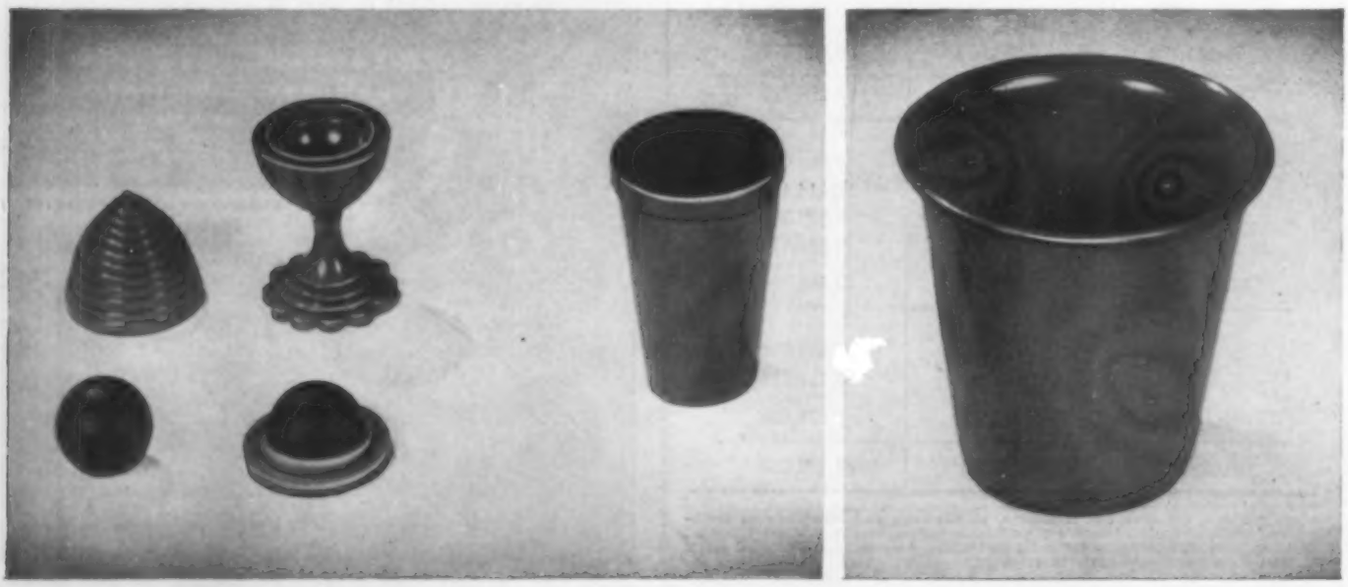
C — Ball and vase magical trick. Plastic base, middle section and cap molded from bright red phenolic in 64-cavity mold. Ball is of wood. S. S. Adams Co., Asbury Park, N. J.

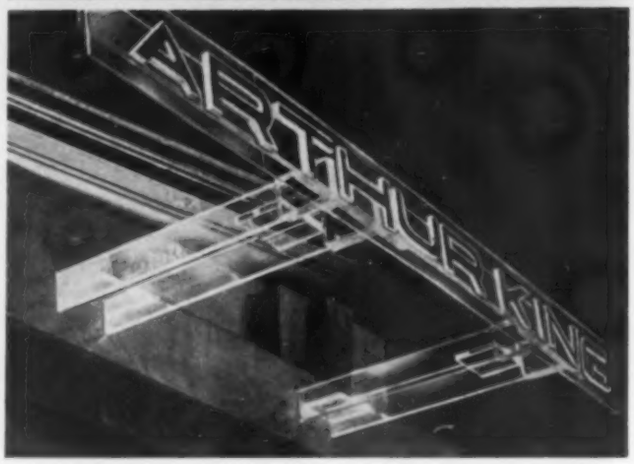
D — Jigger molded from dark red phenolic in four-cavity automatic mold. S. S. Adams Co., Asbury Park, N. J.

E — Flower pots molded out of polystyrene in five sizes: 2¼ in., 3 in., 3½ in., 4½ in. and 7¾ in. across top. All sizes available in six colors: pink, green, yellow, red, ivory, and blue. Rogers Plastic Corp., North Wilbraham, Mass.

*Reg. U.S. Patent Office.

C D E





PHOTOS COURTESY MAT KAUTEN

All-acrylic sign uses no screws, bolts, or guy wires. Light is piped to face of sign through supporting arms

Acrylic Used in Sign Structure

FOR the waxed cypress front of a modern jewelry store in Greenwich Village, New York City, designer Robert Adams McKelvey wanted an extremely simple, modern sign. His solution involved an unusual structural use of acrylic—a cantilevered Plexiglas sign with no supports, screws, bolts, or guy wires. It has already weathered a severe winter.

The sign, for the Arthur King jewelry store, was fabricated under the designer's supervision by A & P Plastics Co., New York, N. Y. It weighs 17 pounds.

The face of the sign, which is 7 ft. long and 7 in. high, is cut from Plexiglas sheet ¼-in. thick. Most of the other parts are cut from ½-in. sheet. The various parts are cemented with ethylene dichloride and dried with infra-red light.

The supporting arms slide into slots in the cypress board front of the store and similar slots in another board behind that. An acrylic peg keeps the arms from sliding out. Light is piped to the face of the sign from cold cathode lights behind the ends of the supporting arms.

LABORATORY Mills & Presses

The EEMCO Laboratory Mill is entirely enclosed, ready to operate. It is equipped with built-in motor, control and variable speed drive. Mechanism readily accessible.

The 12" x 12" EEMCO 42-ton Laboratory Press is furnished with self-contained hand pumping unit, air operated fast closing, steam or electric platens, adjustable opening from 6" to 18".

Both Mill and Press are designed for research, development and small scale production.

Bulletins and additional detailed description on any EEMCO products will be sent on application . . . Early deliveries now.

Sales Representatives

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DUGAN & CAMPBELL
907 Akron Savings & Loan Bldg.
AKRON, OHIO.

EASTERN
H. E. STONE SUPPLY CO.
OAKLYN, N. J.

MIDWEST
HERRON & MEYER OF CHICAGO
38 South Dearborn Street
CHICAGO 3, ILL.

MILLS • PRESSES • EXTRUDERS
TUBERS • STRAINERS • WASHERS
CRACKERS • CALENDERS • REFINERS

EEMCO ERIE ENGINE & MFG. CO.
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Ideal

ONE OF THE LARGEST INJECTION MOLDING PLANTS IN THE WORLD OFFERS EVERY SERVICE FROM MODEL MAKING AND COMPLETE ENGINEERING TO THE FINISHED PRODUCT

IDEAL PLASTICS CORP.
MAIN OFFICE AND FACTORY
184-10 JAMAICA AVE.
JAMAICA, N. Y. JAMAICA 3-7700

Cellulose acetate chessmen, like the handcarved pieces of days of yore, are actual replicas of kings, queens, etc.

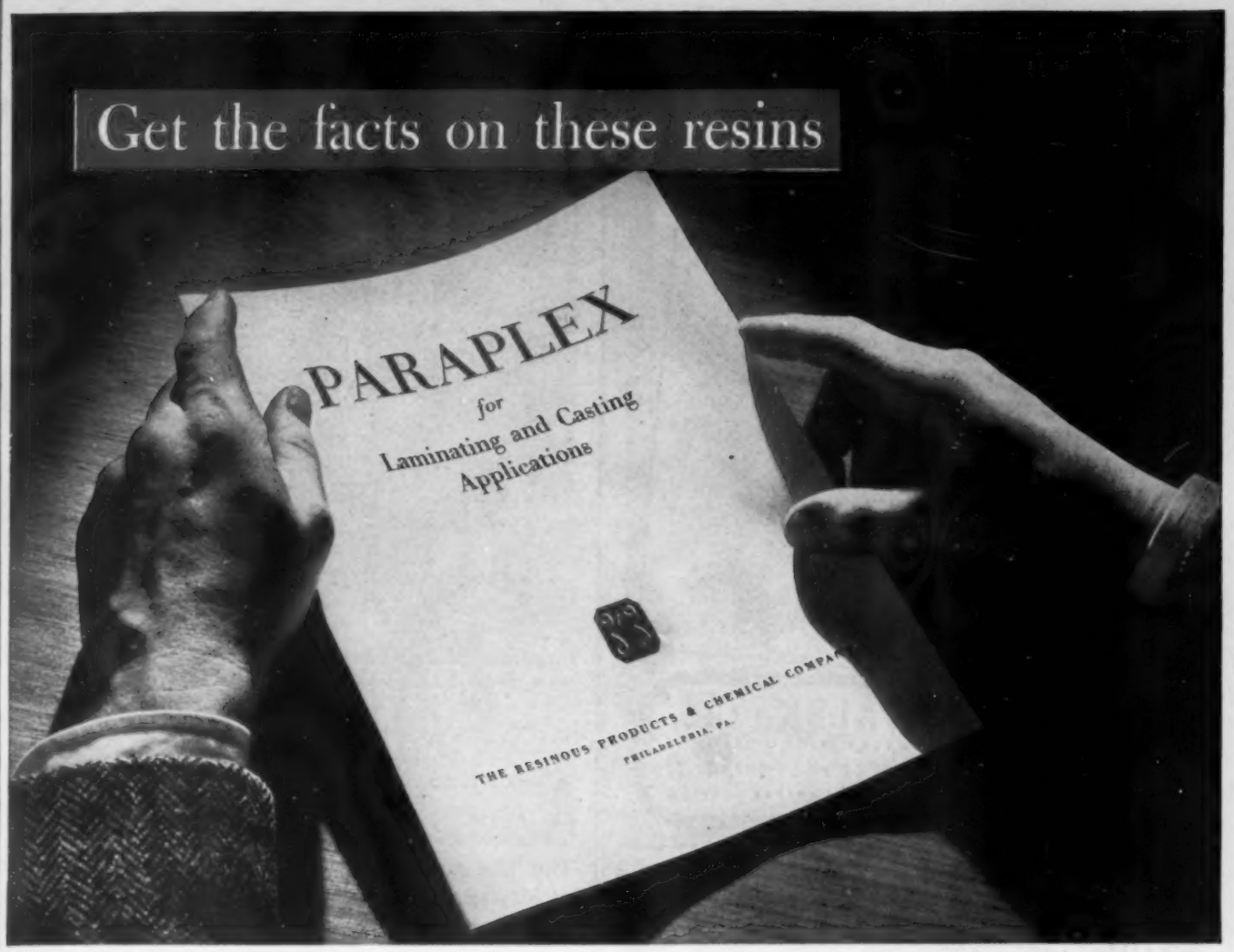
Chessmen in Plastics

TWO new plastic chess sets are now on the market; one is sleek and modern and the other looks as though it were carved in medieval Florence. Both of these colorful sets are made of Tennessee Eastman's Tenite cellulose acetate.

The Kingsway Florentine chessmen, pictured above, are molded by Continental Plastics Corp., Chicago, Ill., for Kingsway, Inc., Chicago, Ill. These injection molded replicas differ from other designs in that each piece resembles the character for which it is named. Finishing operations include clipping the molded pieces from sprue and runners, weighting the hollow bases, and cementing felt to the bottom.

The chess set shown below was molded by Artag Engineering Corp., Chicago, Ill., for the Gallant Knight Co., Chicago, Ill. This new 5-in. set is the official, approved tournament size. Pieces decrease gradually in size as they do in playing value; pawns are not midget size.

Tournament size chessmen molded of cellulose acetate are colorful, warm to the touch, and virtually unbreakable



For rigid or flexible low-pressure laminates—choose Paraplex resins

PARAPLEX P series polyester resins cure at moderate temperatures, under contact pressure, to form clear, tough, thermoset compositions which range from extremely rigid to highly flexible, depending on the PARAPLEX grade or blend of grades. Our booklet, "PARAPLEX for Laminating and Casting Applications," gives you full information on this interesting new series of resins—send for your copy today.

PARAPLEX P-10—transparent, tough thermosetting resin with excellent resistance to water and chemicals. Most flexible of the PARAPLEX series, particularly at low temperatures.

PARAPLEX P-13—a very flexible resin, characterized by excellent color, and compatible with PARAPLEX P-43.

PARAPLEX P-33—semi-rigid resin, outstanding in toughness, and tear resistance. Completely compatible with PARAPLEX P-43 in all proportions.

PARAPLEX P-43—fast-curing rigid resin for castings and laminates of excellent strength, durability, color and electrical properties. Compatible with PARAPLEX P-33 and P-13.

PARAPLEX *is a trade-mark, Reg. U.S. Pat. Off.*

Represented by Cia. Rohm y Haas, S.R.L. Carlos Pellegrini 331, Buenos Aires, Argentina, and agents in principal South American Cities.

THE RESINOUS PRODUCTS & CHEMICAL COMPANY

WASHINGTON SQUARE, PHILADELPHIA 5, PA.

Construction Sets for

Transparent cellulose acetate is used to package toy with polystyrene and extruded cellulose acetate butyrate parts

A LINE of colorful construction sets which need no screws, bolts, clamps, or tools is one of the latest contributions of plastics to the toy market. The toy, called the Master Builder, has injection molded polystyrene parts and extruded cellulose acetate butyrate structural members. The bright red, blue, green, and yellow parts have sales appeal, especially since they are supplied in a transparent cellulose acetate tube-like container.

Five types of parts

The sets are marketed by Master Builders Toy, Inc., Santa Monica, Calif. Each package of parts contains a sheet showing some of the things which can be built with the sets and explaining, with illustrations, how to build them.

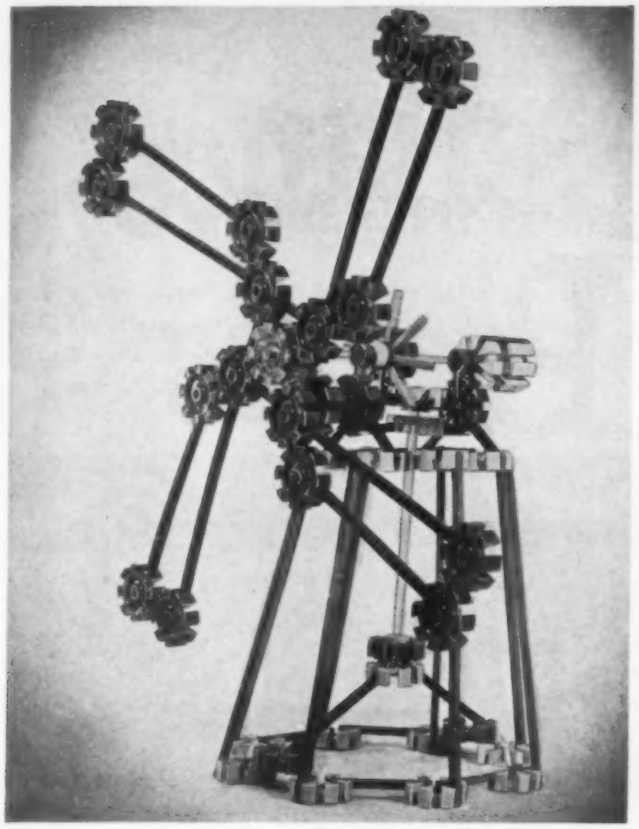
The sets contain three types of polystyrene parts (cogs, locks, and bearings), round butyrate shafts, and square butyrate sticks. The cogs have round holes in the center to accommodate the shafts, and eight openings around the circumference into which the square sticks can be force-fitted. Rubber "tires" are also available and can be put around the cogs to turn them into wheels, pulleys, or belt-driven gears. String serves as a belt.

Extra parts available

Cranes, derricks, ferris wheels, wind mills, and merry-go-rounds are only a few of the construction possibilities. These machines, although held together only by force fits, will actually run if hooked up to a small electric motor.

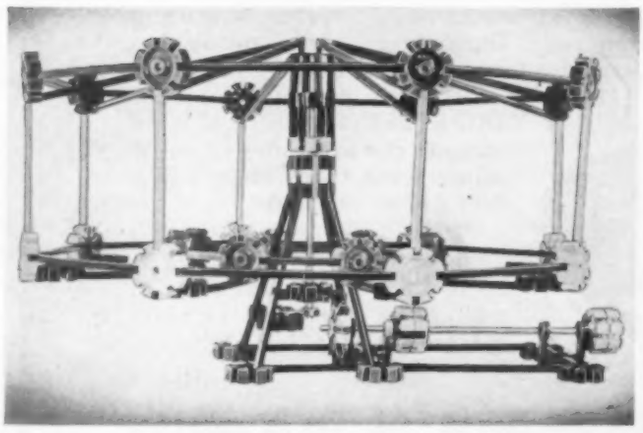
The parts from all sets are interchangeable. In

Young Builders



Windmill is held together only by force fits, but is sturdy enough to run if hooked up to an electric motor

Gears (bottom, center) in merry-go-round are made with short butyrate sticks attached to round polystyrene cogs



addition, the company hopes that set owners will become customers for extra parts in order to build bigger and more complicated devices. The parts are available at the retail outlets which carry the sets—or from the company by direct mail. The company is offering retailers a glass-topped counter unit which displays the extra parts and keeps them separated according to sizes and shapes.

GENERAL ELECTRIC CO.

bought 17 Defiance Preform Presses

Result:

Increased Production ... Saved Labor

In General Electric's molding plants—they have *seventeen* Defiance Model 20 Plastic Preform Presses!

The result—less labor, more output, lower costs!

With Defiance machines running at 60 SPM, one operator can handle two #20 presses—loading and taking away. During three shifts, production from a large die (over 300 gr.) can average 1600 to 1800 lbs. per shift per machine. Die change and cleanup in only 30 minutes for solid die; 45 to 60 minutes for core. Multi cavity dies pay off rapidly.

Write for bulletins on Model 20; also Model 45 for preforms up to 28 sq. in. max. area, or multiple of small size. Defiance Machine Works, Inc., Defiance, Ohio.

DEFIANCE

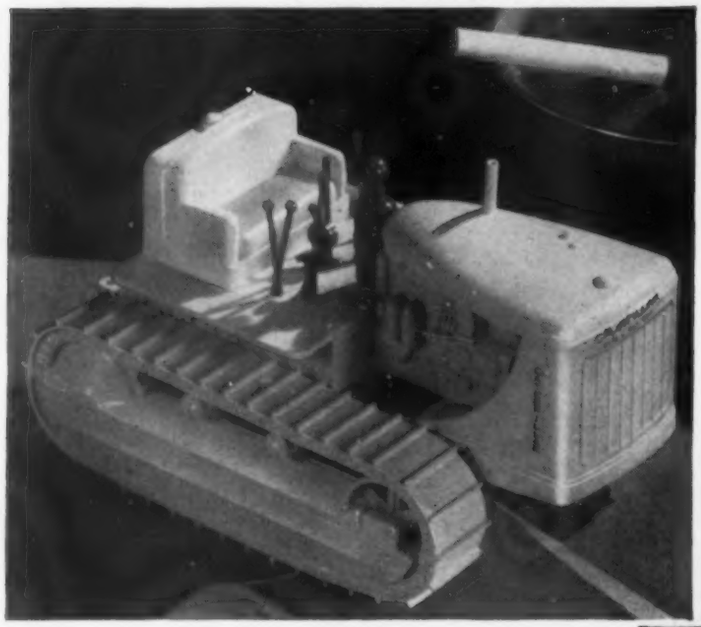
PLASTIC PREFORM PRESSES

98 YEARS OF PRECISION MANUFACTURING

There are good reasons for each KOPPERS Molding Powder

The use to which a molded plastic is to be put dictates the characteristics required. Koppers technical service is at your service to match your requirements with the proper plastic.

CELLULOSE ACETATE



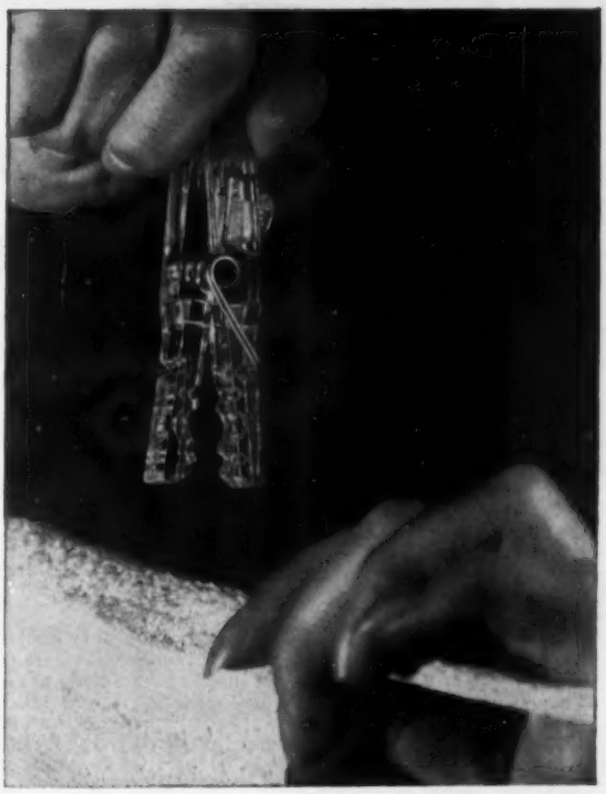
A TRACTOR ON A DESK PUTS AN ORDER INTO THE FACTORY

This scale model of the Caterpillar heavy-duty diesel D-7 tractor, complete in every detail and small enough to sit beside an ash tray on a customer's desk, was made from Koppers cellulose acetate by the Cruver Manufacturing Company, Chicago. Cellulose acetate was picked for this job because of its indestructibility and resiliency; even the tiny gearshift levers resist breakage. It is made from a 22-piece mold and is in the Caterpillar "highway yellow." It's not a toy, but a sales tool made from Koppers plastic.

ROUGH ON THE STEAK AND SMOOTH ON THE HANDS

The handle of this Plasmetl "Tenderizer" is of Koppers Ethyl Cellulose. This tough plastic is used to add color, cleanliness and comfort to the handle. It is splinter-free and resilient. It is "warm" to the touch. It is molded to the fingers. These properties give unparalleled sales appeal to just a handle.

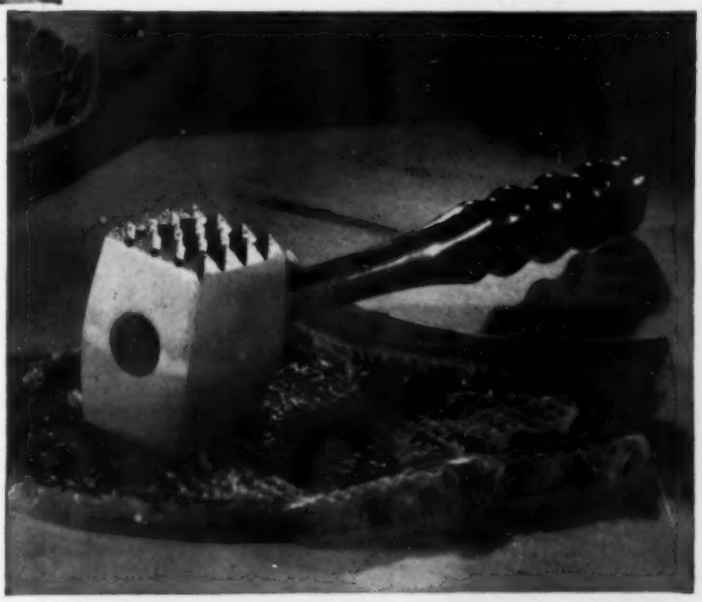
The Tenderizer was made by Plastic Metal Manufacturing Company, Chicago.



POLYSTYRENE

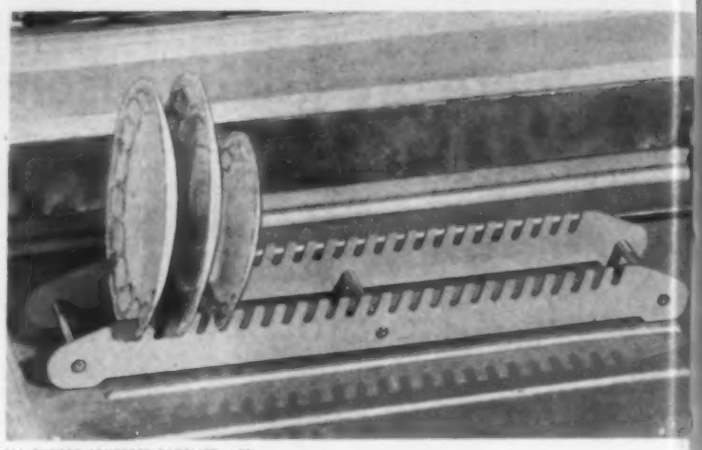
A JEWEL IN HER FINGERS AND A QUICK SALE IN THE STORE

These polystyrene Nu-lock clothes pins, designed by Dold and Morgan Plastics of Oakland, California, and made with Koppers Polystyrene, have a great merchandising advantage over their more prosaic wooden competitors. They are clean, transparent, sparkling and have real feminine appeal.



ETHYL CELLULOSE

KOPPERS COMPANY, INC.
Pittsburgh 19, Pa.



ALL PHOTOS COURTESY BAKELITE, LTD.

Slots cut in the laminated sides of this dish rack, designed to be used on the drainboard, keep wet plates from slipping

British Plastic

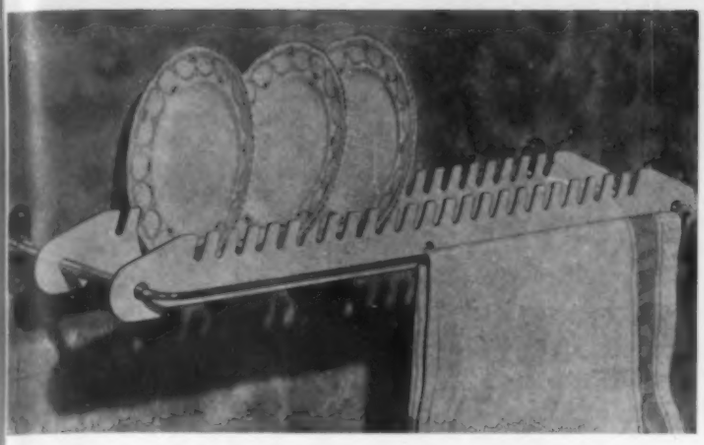
TEA wagons, plate racks, and towel racks, made in England, are designed around the use of laminated and extruded plastics, which have been adopted for their practical qualities as well as for their attractive appearance. From the view point of design, each component is interesting because of the elimination of unnecessary detail. These articles are manufactured by K. D. L. Precision Engineers, Ltd., Cricklewood, England.

The plate racks are produced in two models, one for wall mounting and the other for the drain board. Each has two strips of laminated plastic in which are machined deep serrations to hold the plates. These racks are easy to clean, colorful, steam and moisture resistant, and strong. Under test the wall model was found sufficiently strong to support 24-full size soup plates plus a 7-lb. weight.

Phenolic and laminate used

Plastics are used exclusively in both of the pictured tea wagons, with the exception of the wheels and chromium-plated rails of the trays. The uprights consist of Rockite phenolic extruded tubes, while the trays are cut from Warerite panels. Machining of the panels to shape is done by Warerite Ltd. The edges are finished so that no molding or trim strips are necessary. Constructional principles of the wagons essentially are the same, the only difference being that the four-legged version gives a greater surface area and better stability than that of its three-legged counterpart.

The rack for drying kitchen towels is comprised of five arms cut from Warerite panels, pivoted at the ends. It may be swung out of the way when not in use. The towel rack was designed for a kitchen where space saving is of paramount importance.



Made for wall mounting, this plate rack has sides similar to the one on opposite page, plus a bar for hanging towels

Furniture

Extruded phenolic tubes form the legs of the tea wagon at the right; the trays, cut from laminated panels, have finished edges requiring no trim

A variation in tea-wagon design, using the same materials as the one at the right, is the model shown below

Transparent Washing Machine Uses Acrylic

EXPERIENCE has proved that when a prospective customer can handle an item or see its inner workings he is easier to sell. As a result, working models with acrylic parts are gaining favor with dealers for display purposes.

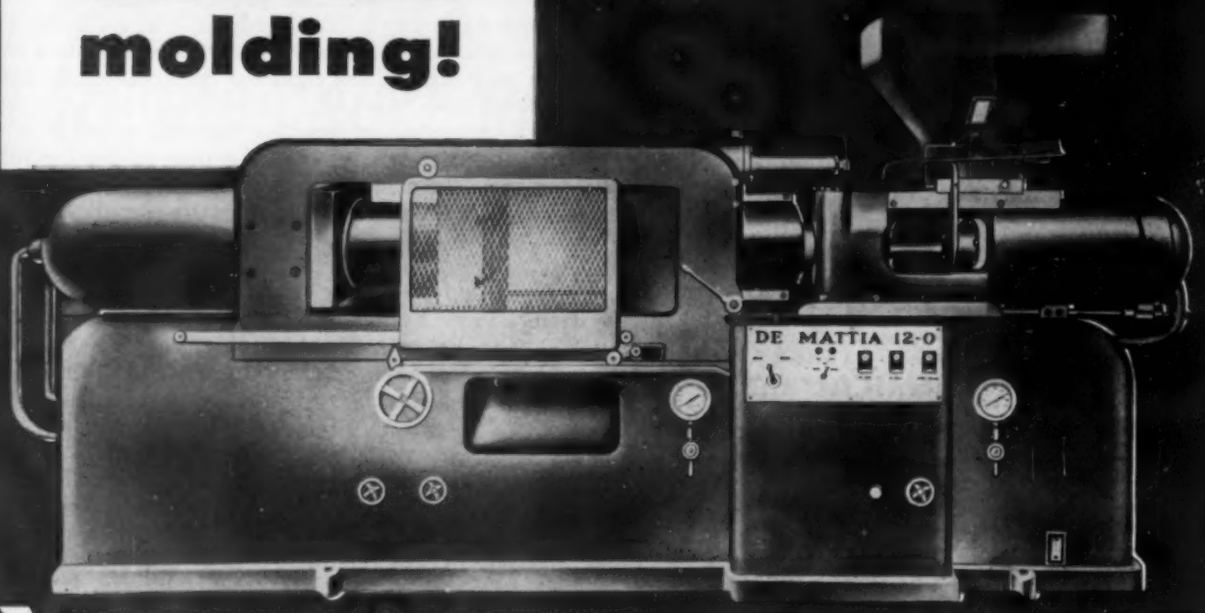
Sears, Roebuck & Co., for example, is now using washing machines with transparent tubs for demonstration in its various stores. These tubs are made in sections by Regal Plastic Co., Kansas City, Mo., for the Nineteen Hundred Corp. of St. Joseph, Mich.

The top and bottom sections are draw-formed from 3/16-in. thick Plexiglas; the center cylinder is formed from a 6-ft. long section of ⅛-in. thick Plexiglas. The three sections are liquid-welded together with a transparent "H" section. The tooling for the top was designed so that the cutout portion of the top is suitable for the removable lid.

Prospective customers can now see inner works of transparent tub that makes use of acrylic

PROVED! —

...for fast, accurate molding!



Rugged Hydraulic Horizontal Press—

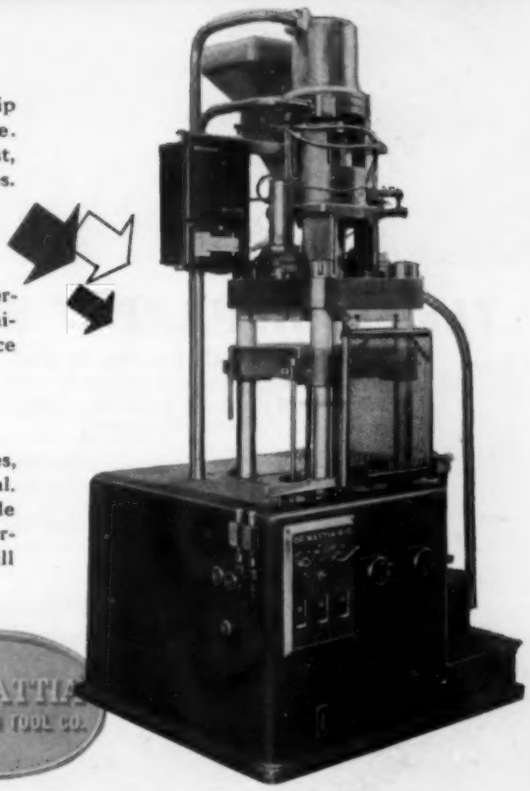
An efficient DeMATTIA press featuring proper design, finest workmanship and materials and built to function smoothly in heavy, continuous service. Solid base and tension members, open feed for visual inspection and fast, contamination-free color changing are only a few of the many advantages. Available in 6, 12 and 24 ounce capacities.

New Vertical Injection Press—

Suitable for general injection molding, the DeMATTIA Vertical Type performs excellently on exacting insert work. Compact design requires a minimum of floor space in the molding plant. Furnished in 4 and 12 ounce capacities. Complete data and specifications sent promptly on request.

DeMattia Complete Molding Equipment—

DeMATTIA Machines for the molding industry include injection presses, scrap granulators and cutters for quick handling of even large scrap material. DeMATTIA scrap grinders make it possible for molders to save valuable storage space and eliminate costly processing charges. For the molder requiring assistance on design, DeMATTIA will plan and make molds that will help assure successful molding. WRITE FOR ILLUSTRATED LITERATURE.



DE MATTIA MACHINE and TOOL CO., CLIFTON, NEW JERSEY

New York Sales Office: 50 Church St. • Cable Address: Bromach, N. Y.

Canadian S. P. I.

(*Continued from page* 109)

such details as the responsibility for inserts, tolerances, tool capacity, material, and color. List the finishing operations that are included in your price. Your competitor may show a "low" price because he includes no finishing.

The conditions of sale suggested for your consideration by the SPI Accounting Committee merit your most careful study. These considerations represent an exhaustive analysis of the factors which have caused vendor loss and customer dissatisfaction. Differences in the conditions of sale may be as important as price differentials.

Follow-up is vital. After you have the order, let's do one more thing to help sell plastics. Write a letter to the customer's sales and advertising departments and tell them why plastics are right for the application. If there are limitations, state them frankly and plainly; request consideration for informative labeling when it is indicated. Your presentation of the plus values for plastics may enlist the customer as an extra salesman for plastics who will tell our story to the entire world.

Better understanding

At the annual dinner on February 16, J. H. McCready, Hale Brothers Ltd., retiring president of the Canadian SPI, was chairman. Guest speaker was H. Napier Moore, editor and director,Maclean-Hunter Publishing Co. Mr. Moore stressed industry's need for a greater understanding of the system of free enterprise under which it thrives. Business, he said, must do more to encourage workers to take an interest in government. What is needed is a more human and closer approach to employees on the part of management.

Merchandising facts as well as wares

At the morning session on Tuesday, February 17, A. E. Byrne, Canadian General Electric Co., was chairman. Ephraim Freedman, director, Macy's Bureau of Standards, presented "Not So Random Thoughts on Plastics."

The plastic industry can be mighty proud of its achievements for no one can deny the magnitude of the contribution of plastics to modern living.

The great retail organization I represent is great because it considers itself the buying agent for the public rather than a distributor for manufacturers. It believes in many good, wholesome things. It believes in merchandising facts as readily as it merchandises its wares. It must carry that which the consumer demands, and must make it available at a price the consumer can afford to pay.

The plastics industry is a comparatively new industry. It is, however, a great industry. Great, because of the vital contributions it made toward winning the war. Great, because it is now helping to satisfy so many different consumer needs.

We have lived sufficiently long with the plastics produced to date to know that, like all other materials, they have attributes and also limitations. It is when we ignore these limitations that we find ourselves in difficulty. The pendulum then begins to swing the other way. Here and there we find an adverse reaction to the use of plastics.

From where I sit, this reaction is not a justifiable one. Also it is to your credit that you give evidence of doing something about it.

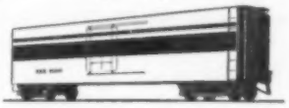
In a survey made in our establishment, buyers were

All in one package!

You must have thought often of the mighty important role shipping plays in your business and private life, for you depend on shipping for practically everything you eat, wear or otherwise use . . .

We of Railway Express know how diverse shipping requirements can be. With the addition of hundreds of new express cars, motor vehicles and other equipment, we are building our service to meet every one of your transportation needs.

Such improvements, as well as rising maintenance and operating costs, have made higher charges inevitable—but these charges will aid us in making Railway Express the *high standard* shipping service for you and for all America.



RAILWAY EXPRESS

. . . Maintains 23,000 offices (there's one near your factory, office or home);

. . . Uses 10,000 passenger trains daily;

. . . Has 18,000 motor vehicles in its pick-up and delivery services;

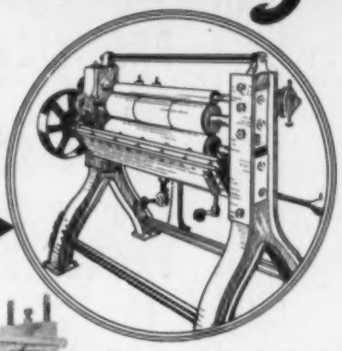
. . . Offers *extra-fast* Air Express with direct service to 1,078 cities and towns.

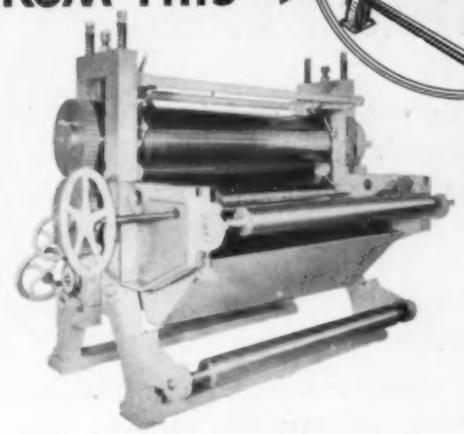
RAILWAY EXPRESS AGENCY

NATION-WIDE RAIL-AIR SERVICE

Plastics Treating

HAS COME A LONG WAY FROM THIS ➡





Above: Sketch of early treater head.

At Left: Latest type WALDRON Medium Duty Treater or Impregnator Head.

. . . thanks to modern WALDRON MACHINES for plastics conversion

In the modern process of treating a fibre mass such as paper or cloth with plastics in solution, the degree of accuracy and uniformity of the treatment or impregnation depends upon the design and construction of the treating mechanism. WALDRON machines with micrometer adjustment are designed to contend with the varying factors in webs and viscosities of solutions that are the chief causes of uneven caliper and finish of the treated sheet.

This modern WALDRON design also reduces to a minimum the amount and cost of solvents required by slower methods.

The book illustrated, Catalog 112 P, gives detailed description of mechanical features involved in treating goods with plastics materials. A copy will be sent upon request.

JOHN WALDRON CORP.
Main Office and Works
New Brunswick, New Jersey
MACHINES

interviewed in stationery, toys, housewares, hardware, infants wear and accessories, linens and needlework, luggage, tobacco accessories and clocks, floor coverings, adult games, sporting goods and optical instruments, notion goods, and window display materials.

Since their comments on plastics are pertinent to your industry, I should like to offer the following suggestions as a result of our survey:

Whenever you consider manufacturing an article, ask yourselves the following questions:

1) Is this article adaptable for the purpose for which it is being created ?

2) How well will it perform these functions?

3) How will it compare functionally with similar articles made of other materials?

4) What are its limitations of use?

5) What are its superior qualities?

6) What precautions, if any, should be taken by the consumer to assist it in functioning satisfactorily, to keep it from deteriorating in appearance, functional ability, and durability?

After answering these questions, consider these points:

1) Compare its selling price with the price of similar articles made of other materials.

2) Affix to your merchandise informative labels telling the consumers what the article is made of, disclosing its attributes, advising as to its limitations of use, and carrying directions for the proper care of the article.

3) Place greater emphasis upon the choice of your raw materials. Do not sacrifice durability for price, unless durability is not important. Do not skimp in the use of your materials. Being penny wise and pound foolish may leave you with dies or expensive molds that are worthless. Pay particular attention to the workmanship of your products and especially to the finish.

4) Inquire thoroughly as to the components of other products which are to be combined with your plastics.

5) Pack your products so that they will withstand handling and shipping without breakage.

Last but not least—as an industry—set about developing consumer goods standards below which you as an industry will not go. In setting up these standards bear in mind that the controlling factors are:

a) Customer acceptance when the merchandise is offered for sale.

b) The ability to keep the merchandise sold—by this I mean the absence of customer complaints.

c) Its ability to develop repeat business.

By following such a program, the plastic industry can build up sales-personnel confidence in its products, encourage customers to buy more plastics merchandise, assure a healthier expansion of your industry, and secure that degree of permanence which is essential to the survival of all industry.

Other speakers, elections

Irving D. Wintrob, M. Wintrob and Sons, Ltd., was chairman of the February 17 luncheon which was addressed by Roland Beaudry, Canadian member of Parliament on the subject of selling and advertising in French Canada.

At the closing sessions of the Conference Irving Wintrob was elected president of S.P.I. in Canada for the coming year. Other officers elected were as follows: Howard Yates, Crystal Glass & Plastics Ltd., Toronto, vice-president; L. C. MacLeod, Monsanto (Canada) Ltd., Montreal, treasurer; A. McL. Carr-Harris, Bakelite Co. (Canada) Ltd., Toronto, councillor. J. H. McCready, immediate past-president, continues on the executive board.

Design by Thalheimer & Weitz, architects; sign by Cutler Sign Advertising Company; Plexiglas fabrication by Croasdale & DeAngelis—all of Philadelphia.

8 YEARS FRESH...BECAUSE OF PLEXIGLAS*

Pouring rain, freezing gales, blistering sun—for 8 years this big Plexiglas bread loaf has withstood them all *without deterioration!* Built and erected in 1940, it has had only minor repairs. Yet today it gleams like new, and the *original* interior paint is in good condition.

PROTECTION—Indoors and Outdoors

Indoors or outdoors, Plexiglas signs last indefinitely. They're sun-proof, weather-proof, virtually unbreakable—and even age does not discolor them. The Underwriters' Laboratories have approved its use in many electric sign installations.

STRONG—LIGHT—Easily Formed and Decorated

Plexiglas is a thermoplastic acrylic resin, easily heated and formed into any shape desired. It can also be sawed, routed, drilled, threaded, turned or milled, just like wood or metal. Weighing less than one-half as much as silicate glass, it is surprisingly easy to handle and install, and since it is rigid and self-supporting often requires no frame or reinforcement. Designs may be applied by carving, engraving, painting or silk-screening.

LASTING TRANSPARENCY—Attractive Colors

In its natural state, Rohm & Haas Plexiglas is colorless—sparkling and clear as fine optical glass. There is an interesting choice of attractive colors for Plexiglas signs—transparent or translucent — as well as black or white opaque.

When It's Plexiglas It's A Good Sign

For signs that are lighter, stronger, longer-lived and more attractive, choose Plexiglas.

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On Selling Plastics

The following observations on some of the problems involved in marketing plastic products are extracted from a speech delivered at a recent meeting of the Midwest Chapter of S.P.I. by Harriet Raymond, assistant advertising manager, Celanese Corp. of America.

WHY should plastics assume the defensive in merchandising? No other industry has intrigued people as much, or has continued to hold their interest as well. Even the lamentable war-time products and the activities of the in-and-out-again manufacturer have not disillusioned the public as to the possibilities of plastics in the home, in the office, in transportation, etc.

The plastics industry is still expected to deliver the latest in modern design, the utmost in convenience, and products which will last forever—all at a fraction of the cost of other materials.

People never seem to tire of hearing about plastics. Raw material producers, trade associations, and trade magazines cannot keep up with requests from worthwhile organizations for speakers. The audiences range from classes of 8-year-old children to groups of members of the New York Stock Exchange.

House Beautiful, one of the foremost home furnishing journals, gave 44 of its cherished pages to plastics in October. Every one of the hundreds of items featured was available in the consumer market—and every one gave the utmost in consumer satisfaction by the rigid standards of the editors of that magazine. Now *House and Garden*, a brilliant contemporary, has announced plans for a plastics issue. In a field where it is not "chic" to follow, that is eloquent evidence of the extent of magazine reader interest in consumer goods made of plastics.

Over and around obstacles

Of course, there are obstacles in the path of the manufacturer with a new product to sell. But some of them are easy to surmount—and there are ways to get around the others.

The problem of training retail sales personnel is one such obstacle. Today the stores do not have sales staffs capable of selling or explaining new products. One example which comes to mind is a new type of plastic luggage which does not need the full lining which consumers are used to. Buyers doubted that their sales staffs could explain the product.

The manufacturer got the information across with a large, illustrated, four-color label. And sales seem to indicate that the label is doing the job.

Another vexing problem is an indication of our industry's youth. Molders often design products

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PLASTICS DIVISION

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with such deluxe qualities that they are priced right out of the market. Eventually molders must learn to meet the use requirements for the product while maintaining the price at a level competitive with existing satisfactory products.

Rigorous tests needed

Other manufacturers err in the other direction. To keep costs down, they use unsuitable materials or reduce wall thicknesses to the danger point. The toy field offers innumerable examples. Throwing the toy into a corner to see if it will break is too often used as a test. The toy often survives the test because it is so light.

Any parent knows that more rigorous tests are necessary. For this market, tests which simulate actual use conditions are necessary: twisting, tearing, treading on the product. Now that powered toys are turning to plastics, such use tests are more important than ever. That market demands adequate wall thicknesses of a high impact material. These toys will cost more than the push type toy—and the public will expect more. If the toy does not stand rough treatment, or if it breaks with dangerous sharp edges, the customer will be displeased—displeased with plastics.

Another obstacle to getting sales is the lack of promotional help. The molder or small manufacturer cannot afford an advertising department. However, there is help available; he can quite properly call on his material supplier.

The plastic material producer is always on the lookout for good examples of his wares in finished products. He himself is dealing with raw materials which cannot be "sold" to the consumer in advertising. Therefore, he depends on the molder and fabricator for illustrations which he can use in his advertising and publicity. Not enough molders and fabricators take advantage of this service that is theirs for the asking.

A valuable selling point

There is also another way to take advantage of the materials manufacturer's advertising. Much money is spent to familiarize the public with the trade names of various materials. A label which links the product with a nationally known trade name can be a valuable selling point.

We have not yet seen the end of plastic product failures, but that is no reasons to get discouraged. Airplanes crash, trains are derailed, and ships sink —but people don't stop travelling. Some types of steel rust and stain—but people don't stop buying products made of steel. The producers keep on striving to develop rustless and stainless products.

All in all, there doesn't seem to be anything wrong with any industry which high standards of quality won't cure. There is nothing wrong with the plastics industry which good product engineering and intelligent merchandising cannot cure.

Sawdust—binder

(*Continued from page* 146)

and water sensitivity, however, will tend to limit considerably its use in low pressure moldings.

Thermosetting binders

For a more permanent bond it was natural to turn to the thermosetting resins, which possess, in general, good heat and water resistance. From the general class of synthetic thermosetting resins were selected those most likely to succeed under the specifications set forth for this study. Various urea and phenolic resins, alkyd resins, and contact-pressure resins were tried. The principal shortcoming in most of these resins was deficiency in wet tack when a practical amount of sawdust was used. Good cohesive tack would be essential in a low pressure molding compound for molding without a form and for attaining adequate strength in the final product, as will be shown later.

In some cases tack was considerably improved when the sawdust-to-binder ratio was reduced to about one part sawdust to three parts binder by weight. For instance, when a urea-resin adhesive, which was supplied as a ready-mixed powder, was mixed with the least amount of water that would cause minimum shrinkage, only about 30% by weight of maple sawdust (20 to 60 mesh) could be incorporated in the mix without seriously impairing the tack or plasticity required for low pressure molding. Even this composition did not possess entirely the desired wet working properties. Another example that may be cited is a liquid phenolic resin containing 76% solids. This resin was first heated to increase its consistency in order to improve its tackiness and then was mixed with various amounts of maple sawdust. When compounded with an equal weight of sawdust, the mix had poor tack, and the molded product was quite porous and had relatively low flexural strength (Formula 6). The low strength was presumably due to lack of cohesion or tack. If molded under moderate to high pressures, a much stronger, coherent product would have resulted.

A number of commercial contact-pressure resins that were tried possessed many of the qualifications of an ideal binder, but their sawdust-binder ratio was rather low (about one part sawdust to two parts resin by weight) and their present cost is prohibitively high for use in this way.

Glycol-Maleate binders

The most promising of all the resins experimented with were the alkyd resins, which seem to have excellent tack qualities along with low coefficient of shrinkage. A thermosetting liquid alkyd was sought, since such a resin would not require the use of solvents and would produce good strength

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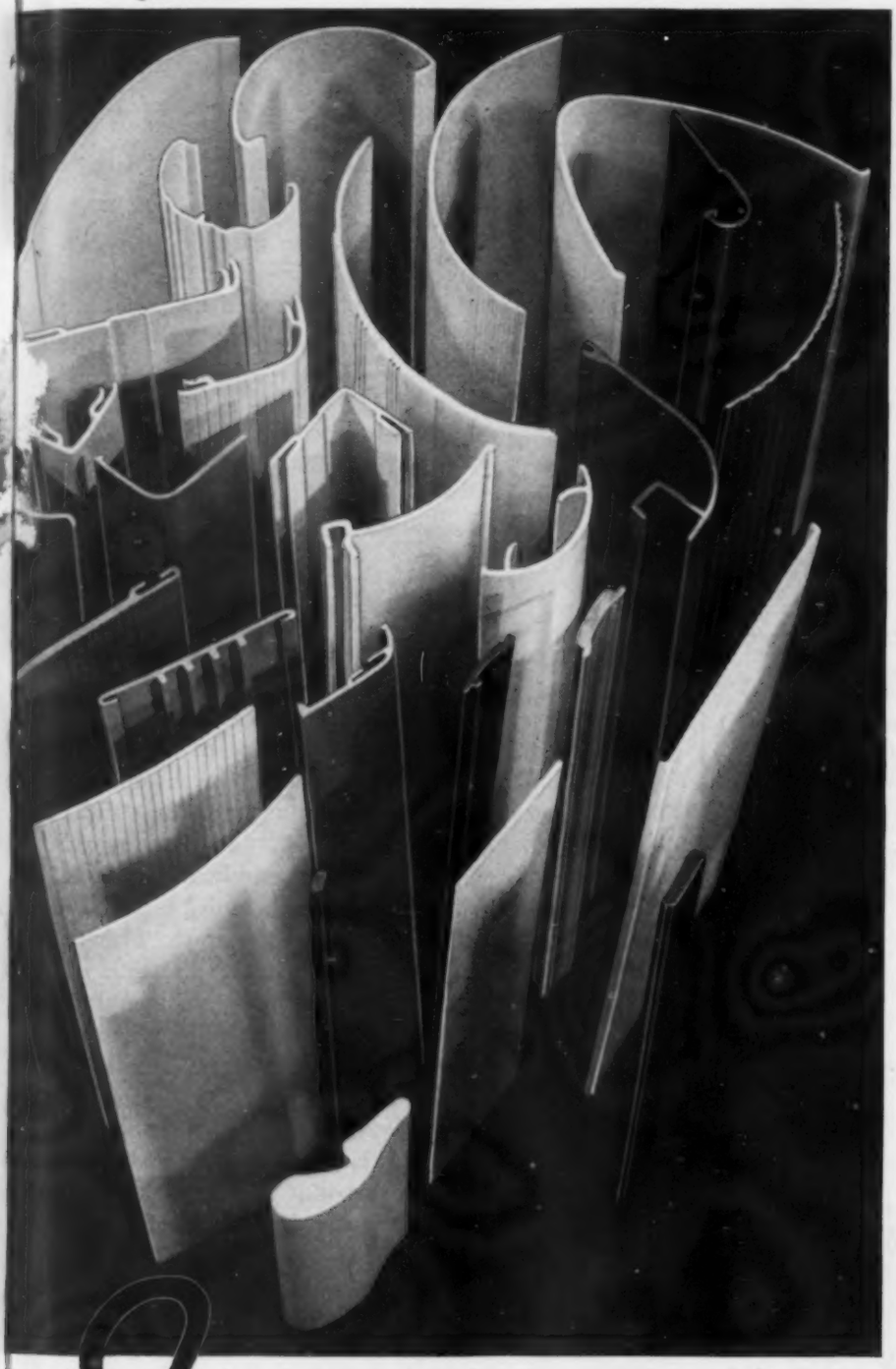

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EXTRUDED PLASTICS AND SPECIAL TOOLS

properties. After investigating several resins of this kind, the one that appeared to be the most promising was diethylene-glycol-maleate polyester (Formula 7), which can be cured in the presence of a peroxide catalyst to a hard product.

This resin was prepared in the laboratory by heating together 98 parts of maleic anhydride and 117 parts of diethylene glycol (the diethylene glycol was 10% in excess of the equivalent amount) in an open glass or acid-resistant metal vessel that was immersed in an oil bath (heavy paraffin mineral oil) to produce uniform heating. The heating schedule was as follows (for small batches of 1 or 2 kg.):

½ hr. to 150° C. (302° F.)
2 hr. at 150 to 160° C. (302 to 320° F.)
½ hr. to 180° C. (356° F.)
4 hr. at 180 to 190° C. (356 to 374° F.)

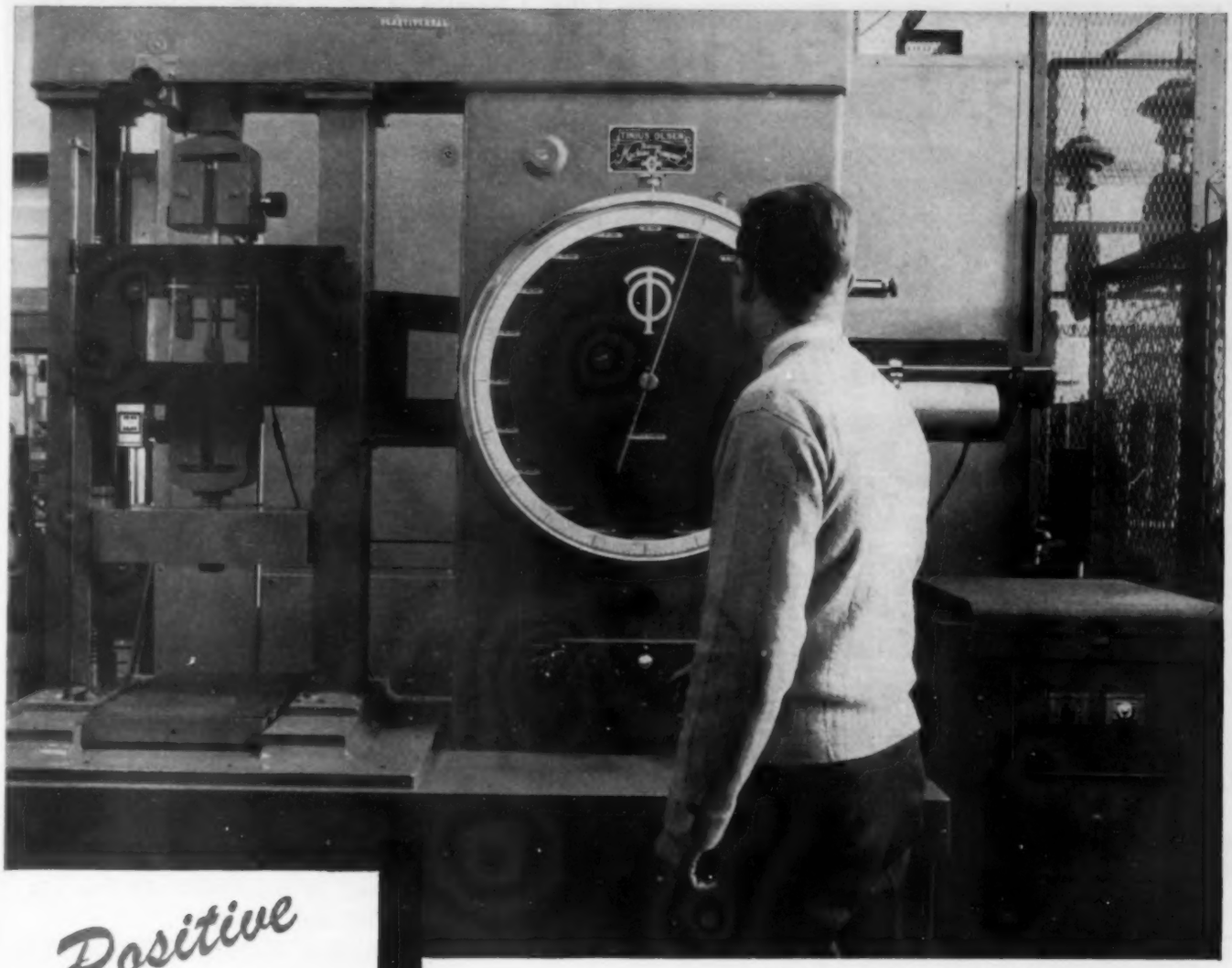
These temperatures refer to the resin; corresponding oil temperatures were usually about 10 to 15° C. higher. The solution was stirred occasionally, more frequently at the beginning. This heating schedule may be varied somewhat without altering the properties of the product.

The acid number of the resin at the end of 7 hr. of heating was about 35, which is the number of milligrams of sodium hydroxide required to neutralize 1 gram of resin sample. The acid number determines the extent of reaction. The resin is light amber in color and taffylike in consistency. It may be stored at 70 to 75° F. for about two months, or longer at refrigeration temperatures.

When ethylene glycol was substituted for over 2/3 of the equivalent amount of diethylene glycol in the foregoing formula, a stiffer resin, which was more difficult to work into sawdust, was obtained. To facilitate mixing, turpentine in an amount of 10% of the weight of the resin was added. A formula consisting of 0.9 part (3 mols) ethylene glycol, 1.1 parts (2 mols) diethylene glycol, and 2.5 parts (5 mols) maleic anhydride produced a resin of satisfactory viscosity. It is probable that this resin can be substituted for the diethylene-glycol maleate resin as a binder for sawdust, but no further experiments were carried out with this resin in the present study.

Because the diethylene-glycol-maleate polyester is simple to prepare and is the lowest in cost of the thermosetting alkyd resins that are tacky and that cure with reasonable rapidity, most subsequent research was focused upon this resin.

It was found that while the rate of cure was dependent upon the amount of peroxide catalyst present, incorporation of certain chemicals for a given amount of peroxide would greatly increase the rate of setting. For instance, incorporation of monomeric vinyl acetate, styrene, or other unsaturated liquids hastened the hardening significantly; but these materials, added in amounts above 5% caused a decided decrease in tack. More recently, it was found



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that a fraction of 1% of cobalt naphthenate drier, when added with the usual amount of peroxide, accelerated the curing rate five or six times.

The glycol-maleate binders could be mixed with sawdust or other fillers either by hand or in a suitable mixing machine, such as a pressure-loaded intensive mixer, rubber or paint roller mill, or a modified meat chopper. When a meat chopper was employed, the knife cutter was removed and a front plate with perforations large enough to offer only a small resistance to the sawdust mix was used (about ¼-in. diameter perforations for a laboratory-size chopper with a 1-lb. per min. capacity). The materials had to be passed through the chopper only two or three times to effect thorough mixing. A number of other mixing devices that were tried, such as the sigma-arm type, the paddle type, or the flat perforated plate beater, failed to mix the ingredients properly, mainly because there was not enough pressure developed in the mixing chamber to loosen any binder that would stick tenaciously to the stirrer or the sides of the chamber.

When the object was to be pressed in a mold, turpentine up to 10% or monomeric styrene up to 5% of the weight of the resin improved the flow of the composition. Above these amounts, turpentine and styrene impaired the wet tack or produced a weaker product. As no odor of turpentine was perceptible after the composition containing about 5% turpentine was cured, it appeared that either the turpentine polymerized by itself or combined with the alkyd resin during the baking operation.

The compound made according to Formula 7 remained plastic (like modeling clay) for at least seven or eight days at refrigerator temperatures of 50° F. or lower. Turpentine had no apparent effect upon the storage or curing properties of the resin. The composition was worked easily by hand into intricate shapes. It was pressed also in simple molds at low pressures of about 50 p.s.i. Removing the objects from the molds in an uncured state usually caused some distortion. Also, when the removed object was baked in an oven at 70° C. (158° F.) or higher, a certain degree of heat distortion took place. If the mixture were stiffened to prevent this distortion, it would require higher molding pressures. Some compromise of these two properties must therefore be made if the molded object is to be cured outside the mold form. For exact reproductions of the mold dimensions it is best to cure the object in the mold.

Objects made from this composition cured satisfactorily at 70° C. (158° F.) in about 16 hr.; at 80° C. (176° F.) in 7 to 8 hr.; and at 100° C. (212° F.) in about 2½ hours. At the higher temperatures there was danger of formation of bubbles, especially for large or heavy moldings. It was found that if 2% of a 2% solution of cobalt naphthenate in benzene or styrene were incorporated into Formula 7,

the rate of setting would be accelerated about six times at 80° C. (176° F.).

Peroxides other than benzoyl peroxide were also tried. Liquid peroxides, such as tert-butyl hydroperoxide or hydrogen peroxide, considerably diminished the tack of the material. Lauryl peroxide, with a creamlike consistency, did not appreciably affect the tack, but it had a tendency to sweat out during the baking operation, and thus to cause more hardening at the surface than in the interior. Otherwise, lauryl peroxide would be preferred to benzoyl peroxide, since it is less hazardous to handle.

The maximum amount of sawdust that could be incorporated into the maleic resin without destroying the required tack was about 40 percent. A compound with 36% sawdust appeared to have the most nearly ideal tack qualities. When 50% sawdust was incorporated, tack was completely destroyed. Such a compound (Formula 8), when cured under the same conditions as Formula 7, tested only 241 p.s.i. in flexural strength or 368 p.s.i., based on unit weight, an indication that tack in the wet state is one of the more important factors that influence the strength properties of the final product.

The cured, molded objects made from the previously described compositions could be readily sanded and machined. Other species of sawdust could be substituted for maple without changing the properties of the compositions to any considerable extent. For instance, southern yellow pine and Sitka spruce gave about the same working and curing properties as maple sawdust when mixed in the same proportions with the resin.

It was found that about 60% of walnut-shell-flour filler (20 to 40 mesh) could be incorporated in the resin without appreciably impairing the tack (Formula 11). The reason that a higher percentage of black-walnut-shell flour than of woodflour can be tolerated by the resin is undoubtedly the lower absorptivity of walnut-shell flour. The cost of black-walnut-shell flour is roughly about twice that of ordinary woodflour.

Inorganic fillers, such as calcium sulfate, barium sulfate, and titanium dioxide, may also be substituted for part or all of the sawdust in Formula 7. The filler should be fairly inert toward alkali, since the alkyd resin is reactive toward alkaline materials, such as zinc oxide. For every part of sawdust almost three parts of inorganic fillers may be used to obtain the same working properties in the wet mixture.

Strength properties of the various glycol-maleate molding compositions are given in Table I (Formulas 7 to 12). These values should be considered as indicative rather than final because of the limited number of specimens tested. Data for a general-purpose phenolic-resin molding compound employed in the manufacture of a multitude of sundry articles used in the home and industry are also presented (Formula 16). This material was included because

it was considered to be one of the best commercial plastics from an over-all standpoint. Its principal disadvantage is that it has to be pressed at very high molding pressures, which necessitate the use of expensive equipment and thereby immensely increase small-scale manufacturing costs. On a specific-strength basis the lighter glycol-maleate plastics are about as strong as the high-pressure phenolic-resin molded products.

Modifications

Various modifications of the glycol-maleate resin binder were tried in order to lower the cost. Of the possible modifiers, rosin appeared the best from the standpoint of cost and physical characteristics. Rosin reacts with glycol to form an ester. Resins that were made by substituting rosin for 1/3 to ½ of the maleic anhydride by weight in the formulation were found to be considerably slower in curing, somewhat more brittle, and more difficult to work into sawdust than the unmodified glycol-maleate resin. Linseed and tung oils were introduced into the rosin-modified maleic resin to improve the flow characteristics of the resin and the flexibility of the final product. These drying oils, however, seriously impaired the tack.

When ethylene glycol was substituted for part of the diethylene glycol (up to two parts ethylene glycol to one part of diethylene glycol by weight), there was no great difference in the properties of the resins in regard to viscosity, curing rate, or flexibility of the cured films. Above this ratio, ethylene glycol tended to increase the viscosity of the resin to a degree that made milling and molding difficult even with 10% turpentine incorporated. Since there is an appreciable price differential between ethylene and diethylene glycols, the use of ethylene glycol in part would materially reduce the cost of the product.

Phenol-formaldehyde alkyd resin binders

It was previously found that one of the phenolic resins had certain very desirable properties, especially a small coefficient of shrinkage and the ability to cure at room temperature, but lacked in tack. Poor tack not only resulted in a crumbly, unmoldable mixture, but also caused poor strength properties in the cured product, as indicated by the data for Formula 6. This resin is appreciably cheaper in cost than the glycol-maleate resin, and, since the alkyd resins in general have excellent tack, it was thought that it might be possible to combine the properties of these two types of resins.

Glycol-maleate, glycol-phthalate, and glyceryl-phthalate resins were mixed individually in substantial proportions with an acid-setting phenol resin, and the properties of the resulting mixtures were studied for suitability as a binder in sawdust. Glyceryl- and glycol-phthalate resins cost less

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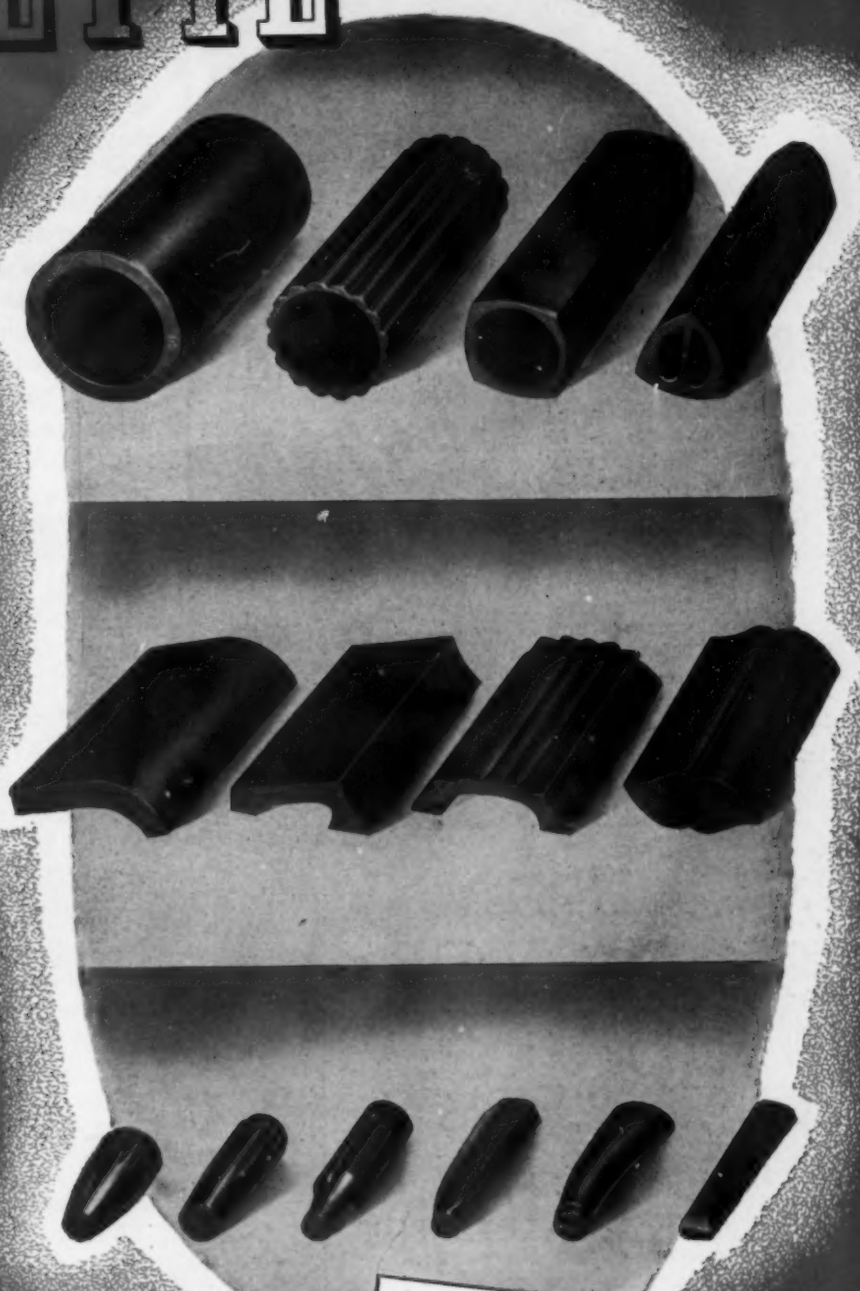

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than the glycol-maleate polyester, but do not become rigid like the maleate resin under the baking conditions that cure the phenol resin. Subsequent experiments showed that if moderate amounts of a nondrying alkyd resin (not more than one-half of the phenolic binder) were used, the final product would be hard enough for most uses.

The above three alkyd resins were compatible with the phenol resin when heated together for a short period at 120° C. (248° F.). The catalyst was added after the mixture cooled to room temperature. Any one of the alkyd resins definitely improved the tack of the phenol resin binder, but the mixtures were still not tacky enough for forming by hand, and too stiff to mix easily with sawdust and to mold under moderate pressures. Addition of turpentine improved the consistency of the mix, but only a limited quantity could be added before the tack was seriously impaired. Diethylene glycol phthalate proved to be a better plasticizer than glyceryl phthalate in the phenol resin, but the final product with sawdust was somewhat less rigid and heat resistant.

Molded test specimens were made from a few of these mixtures, with both sawdust and black-walnut-shell flour as fillers. Table I gives the composition and physical properties of some of these products (Formulas 13-15). Plasticity of the mixture for low pressure molding was not satisfactory. Curing rate of the phenol resin was retarded by the presence of the alkyd resin, so that curing was not effected in 24 hr. at room temperature. At 80° C. (176° F.), the mixture cured to a rigid bond in about 4 hr.; and at 70° C. (160° F.), in 7 hours. At 25° C. (77° F.), the material appeared to cure in approximately six days, but it was doubtful that it had reached complete cure even in this length of time. It may be mentioned here that the amount of hardener (catalyst) may be increased to hasten the rate of curing, but the pot or wet-working life is the determining limitation. The pot life of composition 13 was about 1½ hr. at 25° C. (77° F.).

The strength properties of the cured compositions (Formulas 13 to 15) were satisfactory. Although the water absorption was excessively high (34.5 and 38.5% in 24 hr. and 10 days of immersion, respectively), the material did not swell or weaken much, indicating only that the product was highly porous.

When black-walnut-shell flour was used as filler in the phenol-alkyd-resin binder discussed in the preceding paragraph, a higher filler-to-binder ratio was possible than with sawdust. A similar difference in absorptivity was found previously in the case of the maleic-polyester binder described under Formulas 7 and 11.

Both coarse (20 to 40 mesh) and fine (40 to 80 mesh) walnut-shell flour were tried to note the effect of particle size upon filler tolerance and other properties. It was found that considerably less of the

finer filler could be incorporated in the resin. This difference was not observed in the case of sawdust of similar particle sizes, presumably because the take-up of resin by the walnut-shell filler is on the external surface only, whereas the take-up by the sawdust is both on external and internal surfaces.

The working and curing properties of walnut-shell-filled positions were about the same as those of Formula 13. Either composition could be cured in 8 hr. at 80° C. (175° F.) and in 16 hr at 75° C. (167° F). Physical characteristics of the compound containing walnut-shell flour (40 to 80 mesh) are listed in Table I under Formula 15. Although its strength properties are not so good as those of Formula 13, the water absorption is considerably less. The lower strength properties may be due, in part at least, to the lower binder content.

The chief advantages of black-walnut-shell flour over sawdust seems to lie in its higher filler-to-binder ratio and water-absorption properties. A comparison of Formula 13 with Formulas 14 and 15 shows that a saving of 12 to 16% in binder content is possible when walnut-shell flour is used as filler. The water-sorption characteristics of the cured compositions likewise indicate a significant difference between the two types of fillers. It may be added also that walnut-shell flour produce a harder surface than wood flour. No difficulty was encountered in machining the walnut-shell-filled product.

Decreasing absorptivity by sizing

It was found that none of the binders tried could tolerate more than 50% sawdust by weight without forming a crumbly mass. In fact, the average binder tested tolerated only between 30 to 40% sawdust in the mixture (calculated on weight of dry solids). Addition of inert solvents to increase the sawdust-to-binder ratio of the mixtures resulted either in subsequent shrinkage, loss of wet tack, or both. Solvents capable of reacting or copolymerizing with the resin binder might not cause appreciable shrinkage, but might affect the tack properties. Copolymerizable solvents tested with the maleic-resin binder, namely, monomeric styrene and vinyl acetate, could not be added in appreciable quantities without impairing the tack of the sawdust mixture. Turpentine, however, could be added up to 10% without causing shrinkage or affecting the tack, and it definitely improved the molding qualities of the mixture.

When inorganic substances, such as barium sulfate, titanium dioxide, and sand were substituted for sawdust, the resin binders were found to tolerate considerably more filler (calculated either on volume or weight basis). For instance, as much as 92% by weight of sea sand (20 mesh) could be mixed with the binder of Formula 6 without destroying the tack or molding properties of the mix. On a bulk-volume basis this would mean 55.5% sand

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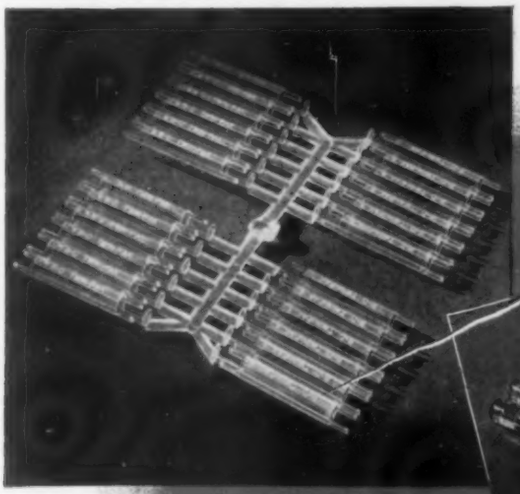
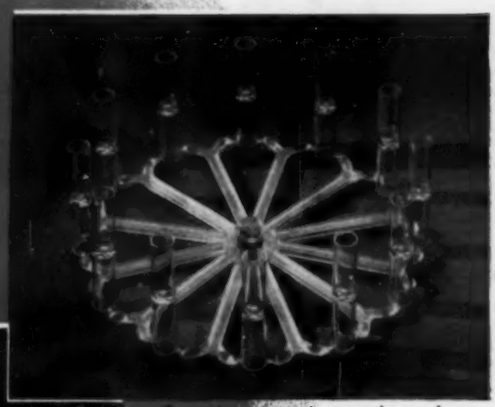
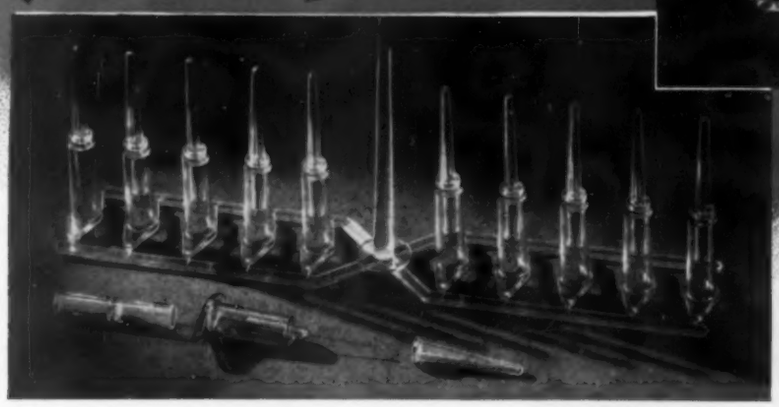


"Twin-Pak" Needle Holder molded of clear polystyrene, holds 2 needles each, as shown at the right.



Double end ampoule used as a penicillin cartridge for syringe in lower illustration. Molded of methyl-methacrylate.



Syringe assembly, showing sprue, runners and gates molded of cellulose acetate.

THE ingenuity of the inventor often calls for equal ingenuity on the part of the manufacturer, to put the design into practical production.

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The Becton, Dickinson & Co. "Twin-Pak" needle holder is another instance of a unique and useful item, that could be molded at practical cost only through "know how" gained by experience and untrammeled by tradition.

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Plastics Division

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and 44.5% binder, since 100 cc. of 20-mesh sand is equivalent to 166 grams. Thus, if sawdust were made internally nonabsorptive like sand, the maximum amount that could be theoretically mixed into this resin would be approximately 63% by weight or 78.5% by bulk volume. Further, when pressure is not applied, the sand grains, which are almost true spheres, can be packed together more ideally (with less void space) than sawdust particles, which are irregular in shape. It is unlikely, therefore, that even if sawdust were made entirely nonabsorptive, the theoretical maximum could be actually achieved.

Various attempts were made to reduce the absorptivity of sawdust to a minimum. One of the first was to coat the sawdust particles with papermaker's rosin size, which is relatively inexpensive and easy to apply in aqueous solution. The procedure was to dip the sawdust into a 10% rosin soap solution and then into a 10% alum solution, wash free the excess alum, and then allow it to dry at room temperature or in an oven. This treatment reduced the absorptivity of sawdust only slightly. For example, a resin that tolerated 35% of untreated sawdust could tolerate up to about 41% sawdust after sizing.

Other kinds of sizes, including paraffin, microcrystalline wax, and beeswax, gave little or no better results than rosin size. These materials were applied in benzene or carbon tetrachloride solution to the sawdust, which was subsequently dried and mixed with the binder. The low-melting waxes, such as beeswax and paraffin, however, imparted low heat resistance to the composition. Stearic acid sizing proved more successful from this standpoint, but it is an expensive size.

Natural or synthetic rubbers applied in a solution of benzene gave the most promising sizing agent yet tried. These rubbers were about twice as effective as rosin size and appreciably better than stearic acid. The percentage of size used in all of the above cases was about 10% of the weight of the sawdust. To reduce the cost of the rubber sizes to a minimum, their latices (water emulsions) were also tried. The latices proved, however, to be much less effective in reducing the absorptivity of the sawdust. Even a combination of rosin size and rubber latex was not so effective as a single rubber solution treatment. It is possible that the rubber solution may form a more continuous film around each sawdust particle than the emulsions of rosin or rubber.

Summary

The common failings of most commercial adhesives tried were the lack of sufficient tack to hold the sawdust particles together while wet and the excessive coefficient of shrinkage. Certain of the contact-pressure resins tested had a number of the qualities of an ideal binder, but the sawdust-binder ratio of the mixes was rather low (two parts resin

to one part sawdust by weight), and their present cost is prohibitive. A suitable binder was finally found from a class of thermosetting alkyd resins. This resin, diethylene glycol-maleate polyester, can be set hard by means of a peroxide catalyst and a cobalt drier in a reasonably short time at moderate temperatures 70° C. (150° F.) or higher. It can be mixed with various fillers in weight ratios that give optimum tack qualities at maximum filler content as follows: two parts ordinary sawdust, hardwoods or softwoods, to three parts resin; approximately one part rubber-coated sawdust to one part resin; three parts black-walnut-shell flour to two parts resin; or about three parts inorganic filler, such as barites, to one part resin.

The specific strength properties of the compound composed of glycol-maleate polyester and rubber-coated sawdust were found to be about as good as those of a typical high-pressure-molded phenol-resin compound commonly employed in the manufacture of toys, novelties, and the like. The polyester-sawdust composition met all the qualifications sought in the investigation, except perhaps cost. The glycol-maleate polyester is not at present commercially available, but can be produced on a large scale by resin manufacturers or may be easily prepared in the laboratory for experimental purposes.

The extremely low pressures at which the polyester-sawdust plastic can be molded make possible a large saving in the investment and maintenance of equipment over that of high pressure molding presses and dies. This sawdust plastic could probably compete successfully in small-scale operations with other plastics now on the market in the manufacture of small articles and certain large-size moldings for which high pressures are not economical or feasible.

Polyamides in Germany

(*Continued from page* 150)

dual steps followed accepted practice, i. e., chip drying, spinning, pretwisting, stretching, twisting, washing, drying, coning and oiling, sorting and packing, except that the washing and drying are additional operations, necessary because of the relatively high caprolactam monomer content of Perlon L after spinning. Chips about ¼ by ½ in. are fed through a hopper into a vertical cylinder and thence to the melting chamber. Air is displaced from the vertical cylinder with nitrogen fed countercurrent to the resin. The melting chamber consists of a jacketed hollow tubular grid which is heated to 270° C. with diphenyl. The molten polymer is fed to a stainless steel metering pump and then through a silica filter to the spinneret. The standard spinneret is V2A

stainless steel, 1.5 in. in diameter by 3/16 in. thick with 12 holes 0.30 mm. in diameter. Speed at the spinnerets is 2250 ft./min. The 12-strand filament is approximately 160 denier at the spinneret and is reduced to 40 denier by 400% cold stretch.

In band spinning a continuous tape 0.80 in. wide by 0.15 in. thick is used as a feed to the spinneret. The band is formed by continuous hot extrusion and molded to accurate dimensions in grooves on two large rolls. The band is then wound on a reel and used as feed for the spinnerets. The band is fed by constant speed rollers through a close fitting opening into the rectangular heating section. The fit of the band in the opening is so accurate that it acts as its own constant speed extruder for the melted material in the hot zone. At the end of the heated zone is a silica filter and the spinneret. From the spinneret the extruded filaments are cooled and stretched 400% on differential speed rolls. Speed from the spinnerets is 1850 ft./min. Both the grid and band methods extrude 40 grams per minute. Denier was not so uniform by the band method as by the conventional grid spinning and there were technical difficulties which had not been solved.

For bristles three spinning heads, each with five holes, are connected to the condensation column. The hole diameters are 0.4 to 0.5 mm. The extruded bristles are quenched in water and subsequently drawn 300 to 400%. They are wound on cones and washed thereon.

The consumption of Igamids in Germany in 1943 for various end uses is shown in Table I. The monthly production schedule issued July 27, 1944,

Table I.—Igamid Production[a] and Use in 1943[b]

Application / Product	Total used	Adipic-hexamethylenediamine salt	Caprolactam	1,6-Hexanediisocyanate; 1,4-butanediol (Igamid U)
	t./mo.	t./mo.	t./mo.	t./mo.
Artificial silk	53	10	43	.....
Fibers	25	10	14	1
Bristles	145	.....	129	16
Lyafol (film)	90	54	36	.....
Perfol (film)	8	.....	8	.....
Injection molding	26	16	10	.....
Artificial leather	36	22	14	.....
Belting (industrial)	30	.....	30	.....
Totals	413	112	284	17

[a]These figures are from PB 1342. Note that figures are on a monthly basis; to obtain annual production, multiply by 12. It is assumed that the figures are in metric tons; 1 metric ton equals approximately 2205 lbs.
[b]This table shows only the amounts of adipicheamethylene salt (AH salt) and caprolactam used in Igamid production for various end uses. It does not show how much of these components were used separately to make Igamids A and B, respectively, and how much were condensed together to make Igamids 6A, 5A, etc. For example, it is known that Lyafol film was made from Igamid 6A which is composed of 60% AH salt and 40% caprolactam. The amounts of the two components shown in this table for this application are in that proportion.

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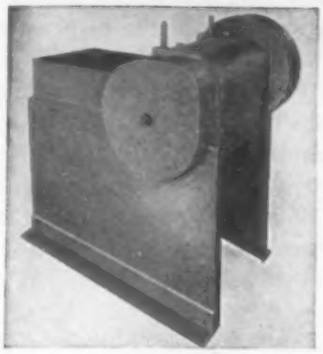

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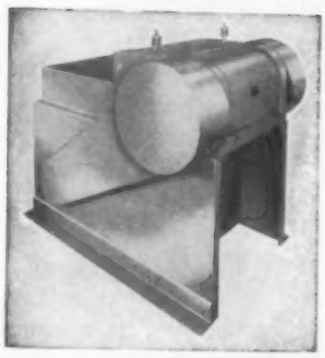

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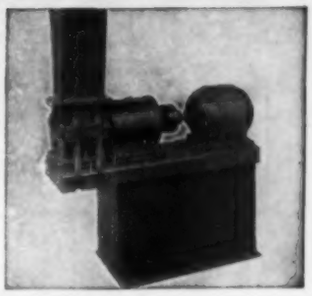

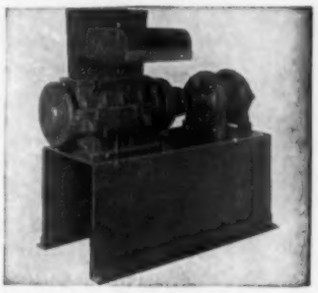

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called for the production of 330 tons Igamid B, 40 tons Igamid A and 5 tons Igamid U for fibers and bristles. The use schedule called for 100 tons tire yarn, 133 tons parachute yarn, 20 tons parachute cord, 50 tons yarn for army uses, 9 tons insulation yarn, and 100 tons bristles. The maximum production attained was 330 tons per month; the forecasted quantities of tire yarn were not produced. Their construction plans were to increase their capacity to 1200 tons per month, of which 900 tons were to be Igamid B and 300 tons Igamid A. Of this 1200 tons per month, 100 tons were to be for Perfol (Igamid B in film form), 200 tons for bristles and monofils, and the remaining 900 tons were to be made into yarn and staple with the eventual balance being 75% of the latter and 25% of the former.

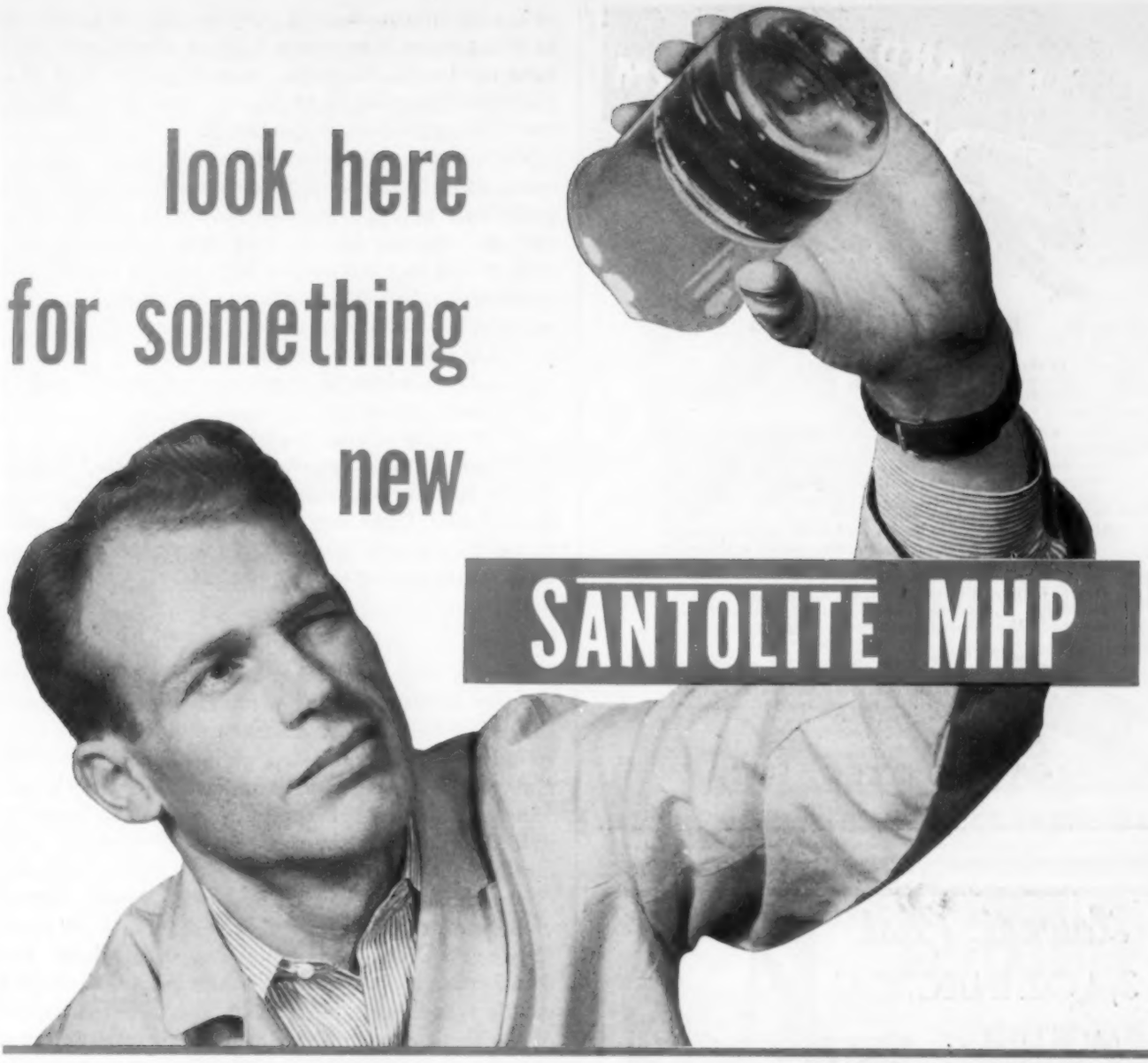
Acetic acid is used as the end-group stabilizer in making Igamid A. A stabilizer is necessary with caprolactam polymer in making chips, but not for band spinning. Camphoric acid and stearic acid had been used, the former only experimentally. These were used because of their low volatility. The best bristles were obtained using 1/250 mol of stearic acid. Diamides had been used as end-group stabilizers in pilot plant scale trials to improve dyeability. The preferred basic end-group stabilizer is 1-amino-6-pyrrolidylhexane, produced in good yield by boiling 1,4-dichlorobutane with hexamethylenediamine. Significant improvement in dyeing properties, particularly in chroming, had been obtained by the use of 1/200 mol of this compound, although spinning properties did not appear to be so good. Less satisfactory results were obtained with open chain diamines. Polyethyleneimine could be incorporated with caprolactam in the condensation reaction, but not with AH salt because of gelling. The chrome dyeing of the caprolactam polymer was markedly improved by the use of 2% of polyethyleneimine, based on the total nitrogen content of the polymer.

Polyamide films

The I. G. began about 1939 to produce polyamide films for war uses, principally gas capes, liners for self-sealing gas tanks, aviators' water bottles and jettison gas tanks. There were two main types: Lyafol, made from interpolymers of hexamethylenediamine-adipic salt and caprolactam, and Perfol, made from caprolactam. Contemplated peacetime uses for polyamide films included raincoats, shower curtains, brief cases, shoe uppers and soles, paper bag linings, book covers and hospital sheeting. Both unsupported films and coated fabrics were being studied.

Lyafol films were made at both Biebrich-Wiesbaden (Kalle and Co.) and Wolfen. The process at the Kalle plant (25 tons per month) was based on the use of an interpolymer made with 60% AH salt and 40% caprolactam, known as Igamid 6A. This resin (m.p. approximately 185° C.) was used because its resistance to boiling water and heat is

look here for something new



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sufficient for commercial purposes and it is soluble in cheap organic solvents. Various plasticizers have been used with this resin, including 20 to 30% of a phenolsulfonamide, 3 to 5% of isododecyl phenol, and dibenzylphenol, respectively.

Various solvent compositions have been tried for casting the films. A mixture of methyl alcohol and methylene chloride permits casting at 70° C. This temperature may also be employed when the resin is dissolved in a mixture of 80% methyl alcohol and water. A typical composition is as follows:

25.0% Igamid 6A
3.8% Isododecyl phenol
71.2% Mixture of 80 parts ethyl alcohol and 20 parts water

Other compositions reported involved the use of a solvent mixture composed of 70 parts ethyl alcohol and 30 parts water, and the use of up to 20% isododecylphenol. Dyes may be incorporated in the solution if they are soluble in it. No work has been done with solutions containing pigments.

Drum mixer

The 6A resin, plasticizer and solvent mixture are fed into a stationary drum mixer which is a drum-shaped nickel-plated container provided with a horizontal paddle stirrer and a reflux condenser. Kalle had two 1000 liter capacity mixers. The mixer is provided with a jacket through which hot water is passed to maintain the solution at 70° C. After 4 hr. mixing, the solution is passed through a jacketed filter which is comprised of a wire screen formed of bronze or stainless steel wire having 2430 openings per sq. cm. and nickel supporting bars. The solution is run into storage tanks, passed through a candle type filter, and fed into the jacketed hopper of the casting machine by gravity, maintaining it at 70° C. at all times. Except for bronze valves and filter wire, all equipment is nickel-plated.

Film casting

The film casting apparatus comprises an endless copperband machine of the conventional type. Kalle has two machines of 34 meters length. The belt moves about two large rollers positioned at each end. The band has a width of 130 cm. and a thickness of 1 mm. The band is enclosed in a chamber through which hot air heated to 100 to 130° C. is circulated. The evaporated solvent is drawn off and after condensation of the water, the alcoholic vapors are recovered by means of activated carbon. The dried film is stripped from the band by means of a pair of rollers between which the film passes but these rollers do not make contact with the band. Adjacent to the stripping rollers is a drying chamber provided with about 10 small rollers and heated with hot air to 80° C. The film is passed in a sinuous path through this chamber for a total traverse of 20 meters to remove residual solvent. The air is passed through

two activated carbon absorbers in parallel to recover the alcohol and is recirculated. The alcohol is fractionated to 95% and reused. No device is used for stretching the film or for cleaning the band surface continuously.

In the production of the film the solution is cast from a specially built hopper[1] on to the band in the form of a layer having a width of 120 cm. There is alleged to be no shrinking in the drying operation. After the solvents have evaporated, the film is stripped from the band and passed through the drying chamber and then wound up. The maximum thickness of the dried film so far produced is 0.12 mm. and the minimum thickness 0.03 mm. The casting speed varies from 100 to 200 meters per hr. depending on thickness. The average thickness produced during the war was 0.04 mm. at a speed of 150 meters per hr.

Two belt-casting machines were installed at Wolfen for making Lyafol films. The belt was 100 ft. in length and turned around 6 ft. diameter drums. The belt surface was silver on copper. The larger machine had a capacity of 100,000 sq. m./mo. and the smaller one 40,000 sq. m./mo.; the total rated capacity was 250 tons per year. The film as first laid down on the larger machine was 140 cm. wide, subsequently shrinking to 120 cm.; on the smaller machine the final width was 90 cm. Film thicknesses varied from 0.05 to 0.2 mm.; casting speeds varied from 120 to 200 meters/hr. One surface of the film was dulled by sandblasting. In addition to using Igamid 6A, an interpolymer consisting of 50% AH salt and 50% caprolactam, known as Igamid 5A, had also been used at Wolfen. A solvent mixture of methyl alcohol and methylene chloride permitted casting Igamid 5A at room temperature.

Properties of Lyafol

The properties of 0.04-mm. thick Lyafol are reported to be as follows:

Film	*Tensile strength* kg./mm.^{2}	*Elongation* %
Dry; lengthwise	3.7	1000
Dry; transverse	3.1	1300
Wet; lengthwise	2.5	950
Wet; transverse	1.8	1000

The films can be sealed with any solvent of the resin. A preferred sealing and laminating adhesive has the following composition:

9.0% Igamid 6A
5.0% Resorcinol
24.3% Ethyl alcohol
53.0% Chloroform
8.3% Water

The main application of Lyafol film for war purposes was in flat sheet approximately 0.1 mm. thick as gas protective clothing. For this purpose it was

[1]See PB 32548.

plasticized with 20% of isododecylphenol, based on weight of resin. Softening point was about 140° C. and brittle point about —15° C. It could be heated at 90° C. for 4 days without loss of plasticizer. Permeability to water vapor in comparison with other films is as follows:

	Permeability g./m.²/24 hr./0.06 mm.
Igamid 6A	120
Moistureproof cellophane	10
Ordinary cellophane	800
Cellulose acetate	150
Polyvinyl chloride (Luvitherm)	10-12

Perfol film

Thin films of Igamid B were made by a melt-cast process at Wolfen under the name Perfol. The films were available up to 150 cm. wide and 0.3 to 0.4 mm. thick after orientation in both directions. Perfol was reported to be superior to Lyafol in resistance to boiling water. It was planned to substitute Perfol completely for Lyafol in gas capes.

A film 50 cm. wide was extruded at 275° C. under 30 to 40 atm. pressure at a rate of 3 to 4 meters/min. before drawing. It was delivered downward to a cooling roll 75 cm. long and 75 cm. in diameter, running at 25° C. A nitrogen atmosphere is maintained until the film has cooled to prevent oxidation. Drawing had to be done within 4 to 5 min. after extrusion for best results. The film was stretched lengthwise 100 to 200%, and subsequently laterally stretched to 150 cm. width. The absolute maximum lateral stretch would be 160 to 170 cm. The room temperature had to be kept below 30° C. and the relative humidity above 60 percent. The dull surface of Perfol was obtained by using a matte-finished casting surface. The physical properties of perfol were given as:

Film	*Tensile Strength* kg./mm.²	*Elongation* %
Lengthwise	25-30	100-150
Transverse	10	400-600

Igamid B was inferior to Igamid A in resistance to sunlight. It was necessary to incorporate 0.5% of dibenzylphenol in order to bring the Igamid B into the performance range of Igamid A. An alternate light stablizer is β-naphthol. Unstabilized caprolactam films had an outdoor exposure life of 6 to 9 months whereas stabilized films had a life of 12 to 15 months. The dibenzylphenol also acts as a plasticizer and is normally used in quantities up to 20%. It is insoluble in water and is not removed by the warm water washing treatment given to films for use in contact with foodstuffs to remove monomer.

In applications in which these films were to be used at elevated temperatures, e.g., electrical insulation, it is necessary to use specific stabilizers against heat. The best class of compounds for this purpose are amine derivatives and all of these darken on exposure. Examples of such compounds

are N,N'-diphenyl-*p*-phenylenediamine and N,N'-dinaphthyl-*p*-phenylenediamine. Two to three percent of one of these was added to the monomer before condensation. Without these stabilizers Perfol would withstand 130° C. for about 24 hr.; with them the films were resistant to 130° C. for several days.

The polymer used for Perfol ordinarily had a chain length of 400 to 500 units. Film-forming properties were largely lost at lengths below 200 units and the maximum chain length was 800 to 1000 units. As made, the polymer contained about 8% monomer and 2.8% dimer and trimer, which are water soluble. This is the equilibrium condition at about 175° C., below which there is no further shift in proportions. Decomposition becomes pronounced at 310° C. and the equilibrium is displaced to practically 100% monomer at 350° C.

Thicker films were made by laminating thin films under pressure, using a 3 to 5% solution of resorcinol in methanol at 40 to 50° C. as the bonding agent. The process was not too successful.

A limited amount of work had been done on the melt-extrusion of Igamid A containing 20% of either dibenzylphenol or isododecylphenol. Without plasticizer the forces required to stretch the Igamid A film were too great.

Stretched tape and belting

Kalle and Co. manufactured a tough tape from Igamid B and marketed it under the trade name "Supron-Band". The raw material was purchased from Ludwigshafen in the form of ribbons in widths of 2 mm., 4 mm., 2 cm., and 3 cm., which had been extruded from the molten polymer mass directly from the reaction kettle. The stretching which oriented the polyamide was of the order of 100% and was accomplished by passing the ribbon over a series of polished hollow aluminum rolls, which could be either cooled or steam heated. The stretched band was used for making netting to catch anti-aircraft shell casings and for weaving ships' hawsers up to 6 in. diameter. They have produced experimentally bands of about 6 in. width for use as driving belts, but found that there was too much slip over the driving pulleys. The narrow belts have been found to be very efficient for driving high speed machines. Other applications included tapes for window blinds, belt lacing, facings for thin leather belts, dog leashes, shoe laces, woven chair seats, and pulley block ropes. For this latter purpose the slip is very great and experiments were under way to give a corklike surface to the extruded tape to prevent slip on a tied knot. Formic acid was used as an adhesive for the tapes. Output of tape was stated to be 3 to 5 tons per month from a plant rated at 10 tons per month.

Polyamide molding material

Dynamit A. G. at Troisdorf prepared injection molding powders from both Igamid A and B. The

compounds were mixed in a tapered screw machine. Igamid B was charged into the extruder chamber kept at about 180° C. The temperature near the end of the screw was 200° C. and at the electrically heated nozzle was 220° C. An orifice 2 mm. in diameter produced a rod of the same diameter which was cut into small cylinders about 5 mm. long. For Igamid A molding powder, extrusion temperatures were 15° C. higher. It was stated that the small cylindrical granules absorbed moisture only half as fast as the chips produced at the polymerizers. Polyamide molding powders were vacuum dried to less than 0.25% moisture before leaving the plant. It was recommended that the molders dry the material to less than 0.5% moisture content before molding at 250° C. cylinder temperature.

During the war the polyamides were used for molding grenade fuzes, brandy flasks, buttons, zippers, flashlight cases, airplane cable fasteners, and electrical insulating parts. Preliminary work had been done on the molding of combs, brushes, shoe trees, tumblers, and hardware for furniture. For billiard balls the polyamides were loaded with enough barium sulfate to give the requisite specific gravity. They had also made bowling balls and pins.

Properties of natural color Igamid A molding material made at Troisdorf were listed in their 1943 catalog as follows:

Specific gravity	1.13
Tensile strength, kg./sq. cm.	1,500
Tensile modulus of elasticity, kg./sq. cm.	35,000
Flexural strength, kg./sq. cm.	1.000
Impact strength, kg-cm./sq. cm.	10-15
Martens heat resistance, °C.	65
Vicat heat resistance, °C.	230

Artificial leather

Igamid 6A is the main type used for artificial leather. For this purpose it is generally plasticized with 30 to 35% of Dellatol, a mixture of 70% toluene butylsulfonamide and 30% toluene ethylsulfonamide. Sheets are calendered at 80° C. The other polyamides cannot yet be satisfactorily plasticized and cannot be rolled out into sheets because of the low viscosity of the melts.

The polyamides can be cross-linked by bifunctional reagents for NH or CO groups, e.g., diisocyanates and formaldehyde. This treatment increases the melting point about 50° C. and improves the water resistance, particularly wet strength in tension. There should be at least one cross linkage per macromolecule. Two percent of Desmodur T (tolylene diisocyanate) gives 2.8 bridges per mol of Igamid 6A. The cross-linking agent is mixed with the polymer on rolls at 60 to 100° C. and is pressed into sheets at 175 to 210° C. for 2 to 3 hours. Aminotriazineformaldehyde and trimethylolmelamine were tried, but are not as satisfactory as the isocyanates. Diphenyl-4,6,4′-triisocyanate (a nonvolatile solid) reacts more quickly than Desmodur T.

THE PLASTISCOPE*

INTERPRETATIONS OF THE CURRENT NEWS

By R. L. VAN BOSKIRK

The phenolic front

Significant developments within the last two months may help to alleviate the current shortage in phenolic resins although the shortage in raw materials from which phenolics are made is still far from settled. Two companies, Monsanto Chemical Co. and the Chemical Dept. of General Electric Co., have announced expansion plans for their phenolic materials. Although no public announcement has been made to date, it is known that the Barrett Div. of Allied Chemical and Dye Corp., is also canvassing the field and organizing a sales staff with the expectation of entering the phenolic market in a big way very soon.

Another development is the increased activity of Harwick Standard Chemical Co., Akron, Ohio, which has created a Plastics Div. to deal specifically with compounding and development problems on plastics and applications of thermosetting resins. This company has been heretofore largely engaged in the development of rubber chemicals.

A development in the reverse direction is the recent partial destruction of the Interlake Chemical Corp.'s Waltham, Mass., plant by fire. This former Makalot plant contributed a good portion of phenolic materials to the industry and has arranged to have its raw materials converted into molding powders by another manufacturer in order to help replace to the fullest possible extent the productive capacity destroyed by the accident.

The Chemical Dept. of General Electric in Pittsfield, Mass., started marketing a complete line of phenolic molding powder late in January. The new G. E. line includes general purpose, high heat resistant, and impact resistant materials. They will be available in standard colors and mottles. The company, which stresses particularly its light oak and red oak mottles, is also marketing four grades of phenolic liquid resins and two grades of varnishes for laminating, impregnating, and binding operations.

General Electric has also introduced two new modified phenolic liquid adhesives designed for cementing metals, thermosetting plastics, wood, fabric, or combinations of these materials. The adhesives are especially useful for cementing metals and laminates; for preparing metal faced, sandwich-type panels; for attaching brackets and lugs to thin metal sheets; and for use in the light vehicular construction found in trailer walls, airplane fuselage walls, and the walls of prefabricated housing. The use of these adhesives eliminates the necessity for sanding plastics. A new phenolic to bind sand cores used in the casting of metals has also been announced by General Electric.

Capacity doubled—Monsanto Chemical Co. has announced the completion of an expansion program for the manufacture of phenolic resins and molding powder which will double its capacity for these materials. The complete effects of the Monsanto expansion program will be felt in the last half of 1948, according to Felix N. Williams, vice-president of Monsanto and general manager of its Plastics Div., in Springfield, Mass. The expansion involves additional facilities for the compounding of the plastics materials, as well as facilities for the production of raw materials. The resin and molding powder production units have been completed at Springfield. Part of the raw materials supply expansion at Springfield is complete, while another supply unit at Springfield and one at St. Louis, Mo., are yet to be finished.

The raw materials units include a wood flour plant and a formaldehyde plant at Springfield and a phenol unit at St. Louis. A new formaldehyde unit is expected to be completed in May and the phenol plant in July. With the completion of these two plants, Monsanto will be independent of outside sources for the basic raw materials used in the production of phenolic plastics, of which Monsanto has been a major supplier since 1939 when it acquired the capital stock of the Resinox Corp.

Demand still increasing—There is still some doubt in the minds of observers as to whether or not these proposed increases in phenolic production will satisfy demand. Demand for molding powder is still going up although there was a slight drop in demand for other phenolic types in February.

Despite the fact that Monsanto will have its own raw materials, and General Electric will be able to draw upon the production of its own phenol plant which went into operation last Fall, producers in general still insist there isn't enough phenol and formaldehyde to meet the ever-increasing demand.

Demand for formaldehyde will, no doubt, ease this spring when methanol, from which it is produced, is not needed in such large quantity for antifreeze. The phenol situation shows no apparent easement in the near future, and one producer says it will be tight at least until 1950.

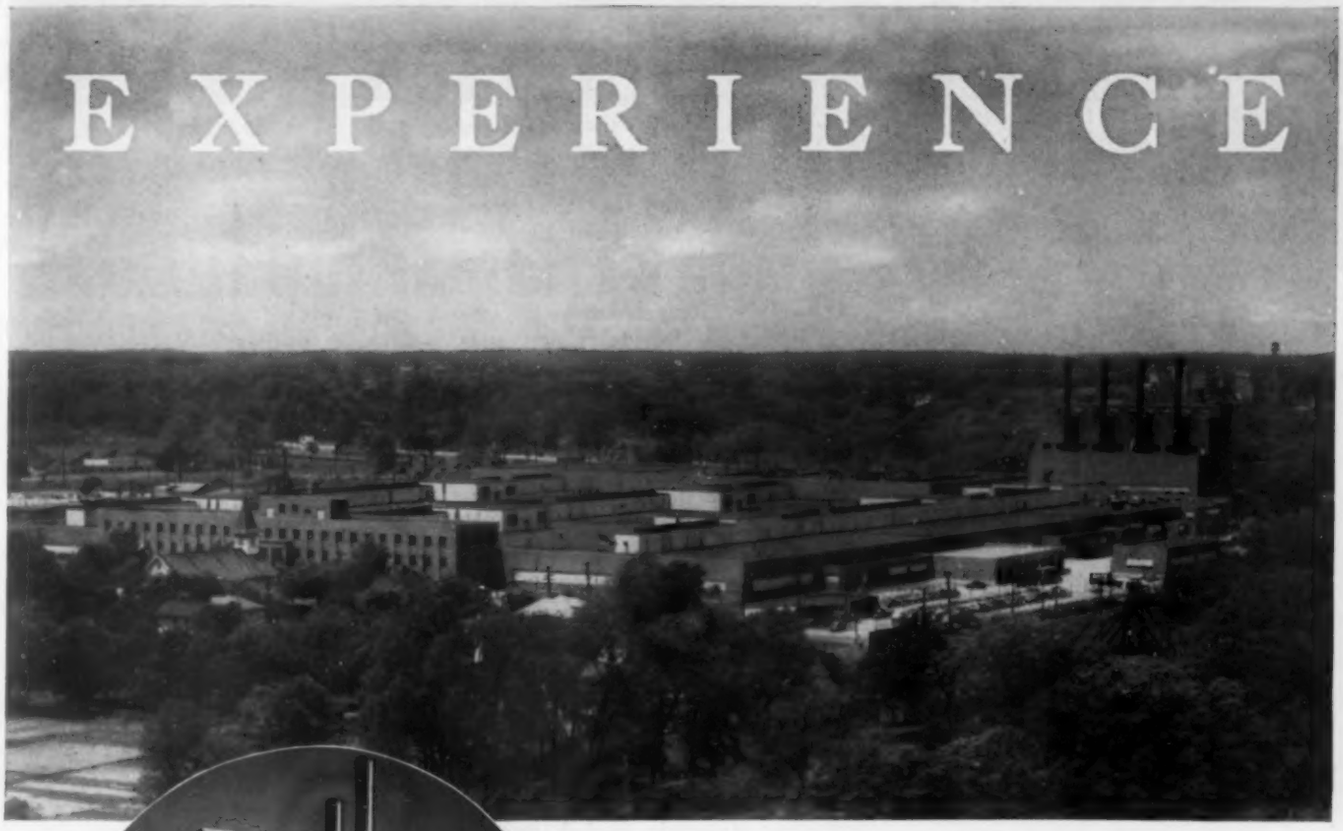
The annual meeting of the Society of the Plastics Industry will be held in the Ambassador Hotel, Atlantic City, N. J., on Thursday and Friday, May 20 and 21. Program arrangements are still in formulation. Alfred C. Manovill is chairman of the Annual Meeting Committee.

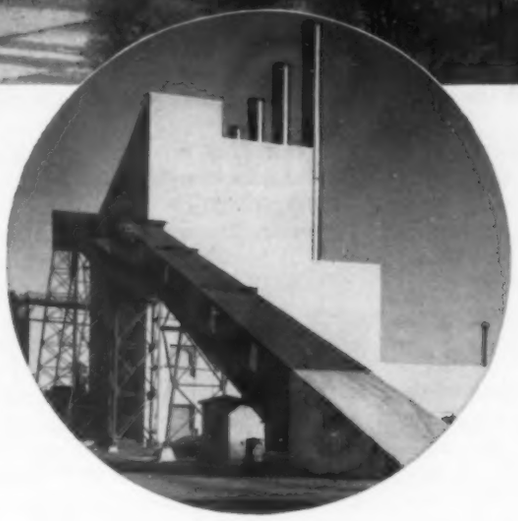
The acrylic front

In view of the rumblings from Detroit at the end of 1947 which implied that automotive companies were cutting down on plastics, it is interesting to note the following list of automotive applications of Plexiglas as furnished by Rohm & Haas Co. This company asserts that it is only a partial list . . . but sufficient to tell the story:

Buick is using a Plexiglas horn button, front name plate, and rear

EXPERIENCE





Stone & Webster Engineering Corporation designed and constructed this Plant at Fort Wayne, Indiana, for the Defense Plant Corporation. It was operated during World War II by General Electric Company.

DESIGNED and built during the War, this plant, now owned by General Electric Company, is an example of what Stone & Webster Engineering Corporation offers clients in the industrial fields.

STONE & WEBSTER ENGINEERING CORPORATION

A SUBSIDIARY OF STONE & WEBSTER, INC.

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name plate. Oldsmobile: shift indicator for Hydromatic control, speedometer panel, and hood ornament. Chevrolet: horn button.

Kaiser-Frazer: horn and door buttons, speedometer and instrument lenses, back numeral plates.

Hudson: horn button, hood medallion, instrument dials, and rear tail light.

Packard: 5-in. diameter horn button, radiator ornament insert, and instrument dials.

Chrysler: stop light on rear deck of car, speedometer, clock, and instrument dials. These same applications apply in many cases to the Dodge and DeSoto cars, the latter of which also uses a radiator or hood ornament. Plymouth, Dodge, and DeSoto use a steering wheel medallion or horn button.

Ford and Mercury: horn buttons, hood ornament, instrument dials.

The size of this business in an industry that is contemplating the production of 5,000,000 automobiles in 1948 may be implied by the fact that horn buttons alone use from 1 to 2 oz. of material, and the Chrysler stop light uses 4 ounces. The illuminated DeSoto hood ornament requires 7 ounces.

Acrylic for buses

Sight-seeing buses in New York City have been given a new and fuller look for their patrons' benefit through some big new acrylic sheets produced by the Steiner Mfg. Co. Sections of the bus just beneath the roof have been cut away and replaced with formed sheets of acrylic so that passengers may view the sights without stretching their necks too much.

Another feature for buses soon to be announced is a sheet of acrylic to be placed above the windshield. This extends the windshield almost up to the top of the bus and gives the driver better vision and more light. The section is about 24 in. wide and ¼ in. thick.

...g volume in signs

The greatest use of Plexiglas by the end of 1948 will be in large signs, predicted Ted Linforth of Rohm and Haas at the last meeting of the Plastics Club of America. In describing new uses for this material, Mr. Linforth showed slides illustrating the use of 27 by 25 in. acrylic panels in ceilings for light diffusion. He stated that they were not affected by heat from 100-watt incandescent lamps placed 9 in. from the panel.

Other uses illustrated were the enlarging lenses for television sets which might be used for magnifying jewels and other small objects for display purposes. Samples of embedded silver and jewelry were also shown as display media. Mr. Linforth said that embedment is still a difficult operation but one that can be successfully done with careful technique.

Urea price change

The basic price of urea molding powder in large quantities was raised from 27½ to 28¢ in March. The increase was caused by continual price advances in chemicals and other materials needed for production purposes.

It is not believed that the supply of urea molding powder will substantially increase until this Fall because of the shortage of urea crystal and formaldehyde; the latter may ease up in late Spring. New supplies of urea crystal are not due until Fall.

Suppliers have increased their production facilities from 35 to 50%, but the increased facilities are of no help when raw materials in sufficient quantity are unavailable to operate the plants at production capacity.

Marvinol reaches market

First shipments of Marvinol VR-10 vinyl resin to fabricators and processors of plastics were made by the Chemicals Div. of The Glenn L. Martin Co. at Painesville, Ohio, in March.

Robert H. Kittner, vice-president in charge of the Chemicals Div., pointed out that production records during the first few weeks of operation have shown that annual output will be increased considerably from that first estimated. The Martin Co. now expects to contribute quite substantially to the approximately 235,000,000 lb. of vinyl resin requirements which the plastic industry predicts it will utilize in 1948.

"The introduction of Marvinol VR-10 into the plastics field marks for the first time the availability of a high molecular weight vinyl resin which, when properly compounded, can be extruded, calendered, made into rigids, or formulated into dispersions," said Mr. Kittner.

The Martin Co. expects that future demands of the plastics market will be far above the 235,000,000 lb. required in 1948 and already is making plans to enlarge its Chemical Div. as swiftly as future developments demand, according to Mr. Kittner.

Assisting Mr. Kittner in directing the activities of the Chemicals Div. are Clayton F. Rubensaal, technical director; Harold M. Parsekian, director of sales and technical service; Dr. Karl Kammermeyer, manager of research and development; Henry S. Curtis, plant superintendent, and Dr. William J. Lightfoot, chief engineer.

Film for packaging

The question of the part that plastics will play in the future of packaging is of ever intriguing interest to the plastics industry. From all the conversation that is loosed on the subject, one would think it was already a major outlet, but such is far from the case. Search as you will, it is doubtful that anyone can be found to establish proof that even 10% of present plastics production is going into packaging.

This is not to say that the potential isn't there and that several processors haven't capitalized in a big way on the packaging outlet; but, in general, the surface has hardly been scratched and won't be until the plastics industry bends more effort towards finding out what is required of packaging materials.

Such is the opinion expressed by an eminent technical authority on packaging whose sympathy towards plastics is unquestioned, but who feels that the plastics industry has come nowhere near meeting the packaging industry's needs for low-cost materials. He says that there will, of course, always be a market for certain relatively high cost plastics packaging materials, but great volume will never be attained until plastics takes over low-cost markets en masse, just as cellophane has done in its particular field.

100,000,000 lb. a year—Thin films are the particular target for our informant's rifle. Remember, we are not talking about small volume, but something that might approach 100,000,000 lb. a year which, in it-

THE PLASTISCOPE

self, would be only 12% of the 1947 total production of plastics materials.

Obviously, the big new markets aimed for and particularly applicable to plastics are frozen food and prepackaged fruits and vegetables. Our informant outlined the following factors which he thinks must be understood and observed before plastic films will ever have a big market in packaging:

1) Plastic thin films must have certain properties required for the preservation and protection of the package contents. For frozen foods they must have low temperature flexibility; for prepackaged fruits and vegetables, desirable properties are water vapor and gas permeability. Obviously, they must be tough, odorless, and non-toxic.

2) Films must be capable of being made into package form at low cost. There are some exceptions, such as poultry packaging which is done by hand, but, by and large, the film must be capable of withstanding machine handling. Not many of today's automatic packaging machines are designed expressly for thin, flexible films: it is too soft and is difficult to use without laminating or other support; it can't be pushed through a machine like paper. Our informant, Mr. X, says, "When we get the proper film, we'll build the machine to fit: the film must come first."

3) The cost of the film, plus cost of fabrication, must be kept in a low ratio to the cost of the product to be marketed. You can't put a 10¢ bunch of spinach in a 5¢ bag.

Some ideas click—Once in a coon's age someone comes along with a spanking new idea like the new oleomargarine package where, because of its novelty and special purpose, a higher cost can be absorbed. Generally speaking, however, there is no future in such things as 5¢ wrappers for bread loaves, etc. In jewelry, and sometimes in cosmetics and drugs, the story is different; but even in drugs, the margin is small; for example, there was a recent attempt to make a tiny molded polystyrene pill box with a trick dispenser complete with a standard tin box. The latter cost 1¢ or less; the molded box would have cost 2 or 3 cents. The pills are still going to market in tin without the trick dispenser.

Despite his admonitions, don't think that Mr. X, is unduly pessimistic; he thinks that plastic films have come a long way. They have contributed considerably to this particular branch of packaging which started with paper.

Hidden uses—Many plastics and synthetic resin uses in packaging are even now of good size but are hidden from view. Synthetic resins have contributed to a lacquer for moistureproof labels and for use in heat sealing foil. Adhesives, starting with starch and animal glue, have been improved by the use of synthetics. And there are a multitude of laminates combining paper, fabric, cellophane, metal, and plastics that have made packaging tricks possible. The acetate-metal foil laminate providing a flexible wrap for soluble coffee is an example. Nitro cellulose coating on glassine for prunes and greasy products is another variation. Waxes modified with polyisobutylene offer another. And plastics with paper have increased the latter's use in packaging by a large percentage. Nevertheless, the volume of all these variations is tiny today in comparison with what may be expected when the plastics industry really concentrates on the problem.

Other handicaps—Mr. X points to frozen food as Exhibit A. Today the packages for frozen vegetables and fruit are primarily combinations of paper, cellophane, and wax. Polyethylene looks highly promising but is still high in cost. Acetate and ethyl cellulose are unsuitable because of water vapor transmission. Saran is handicapped by fabrication problems. Plasticized vinyl is too brittle at low temperatures and has other deficiencies. A vinyl latex has been developed that might be used if coated over kraft paper so that it can be heat sealed.

Eventually these problems may be overcome, but until they are, paper, cellophane, and glassine will continue to hold this market. Some meat has been packed in polyethylene, cellophane, acetate, Pliofilm, a saran-nitrile rubber combination, and foil, all purely as a means of preservation. There are few indications of such packages being used for their promotional value.

Exhibit B. Prepackaged food wrapping today is largely done with cellophane. Cellulose acetate has made great inroads, partly due to its gas and vapor permeability levels, and producers feel that they are well on the way to capturing a large portion of this market. It should be pointed out, however, that various foods require different types of film, and acetate is not always the answer.

Ethyl cellulose is another possibility. Polyethylene and saran are handicapped for entrance to the prepackaged vegetable market because their permeability characteristics are not suited for the product. Packaged vegetables need to breathe in certain ways, and not enough water vapor nor gas can get in or out when enclosed in those plastics.

Vinyl for packaging poses the plasticizer problem and its accompanying migration and odor hazards. The oleomargarine package of vinyl plus nitrile rubber may be a hint of what can be done. Vinyl latices offer promising possibilities because they eliminate plasticizer problems and can be processed at room temperature. S polymer, a high styrene copolymer, is claimed to be helpful with some foods, and rubber combinations are reported to be successful in stretch-wrapping oranges and other foods.

The field waits—There are thousands of pounds of materials to be consumed and thousands of dollars of profit to be made by the plastics industry if it digs into this phase of packaging quickly and intelligently. Mr. X says, "We're awaitin' for you. Get goin'!"

Errata

A red robin recently flew in the window to inform us that there were several persons who did not agree with our estimate of a 235,000,000 lb. total capacity for vinyl resins in 1948, as printed in the January review number. The robin said that capacity, including all the new installations to come in this year might be closer to 300,000,000 lb. (all types of vinyls) and that we had not accounted for enough increase on the part of the older producers. Vinyl chloride and copolymer production above 92% vinyl chloride however might equal the 235,000,000 lb. figure mentioned above.

The robin had no more than gone than a blue jay perched on our desk and screamed to us that the acrylic sheet production we mentioned was also off a bit. In the magazine, we said that the volume of acrylic sheet

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production at the end of 1947 was running at some 2/3 to 3/4 of the war-time rate. The war-time rate is supposed to have been around a 30,000,000-lb. annual rate. The blue jay insisted that the rate at the end of 1947 was more nearly between 60 and 65% of the war-time rate. Note that this was the *rate* of operation in November. Total production for the year was probably not equal to half the war-time rate.

1947 machinery figures

We have been questioned concerning our estimated figure of 350 injection presses sold by manufacturers to domestic users in 1947. The figure was printed in MODERN PLASTICS review number, January 1948. The manufacturers cooperated magnificently in supplying statistics, but there was a slip in our own tabulations. First, a figure from the 1-oz. machine column was accidentally included in the total; furthermore, we included in this total the 22 two-ounce machines sold in 1947. In former years 1 and 2-oz. machines have been completely omitted. Our total of injection machines 4 oz. or larger that were delivered in 1947 should, therefore, be 311, rather than the over-all figure of 350.

The totals by capacity for 1947 were as follows: 4 and 6 oz., 48; 8 oz., 108; 9 to 12 oz., 85; 16 oz. and over, 70. The totals include the figures of those companies who came into the field with new presses in 1947.

For comparative purposes, the reader may be interested to know that of the 1500 machines delivered in 1946, some 1100 had a capacity of 8 oz.; slightly more than 100 were less than 8 oz. (exclusive of laboratory machines); more than 150 were 12 oz.; and the balance were 16 oz. or larger.

Plant preservation

The vinyl Geon Latex 31X developed by B. F. Goodrich Chemical Co. and described in the February MODERN PLASTICS, p. 81, is responsible for a press release from Michigan State College, stating how the latex prolongs the freshness and original appearance of certain cut flowers, evergreens, and ferns. It is applied at moderate cost by dipping or spraying and seals the natural moisture within the plants. Hand-operated spray equipment can be used if necessary.

The latex has no toxic effect on most vegetation and dries at room temperature to form a transparent coating of less than 0.001 in. It is not washed off by rain or affected by DDT. It is presumed that flowers and shrubs may be coated with this material and shipped long distances with safety. Hundreds of Christmas trees were successfully treated with it during the last Holiday season, and gardenias are said to take the treatment without losing any of their natural beauty. The potential for this market is estimated at several million pounds annually

Home Builders meeting

At the National Association of Home Builders meeting in Chicago, there were many items of interest to the plastics trade, the most significant of which are mentioned below.

One of the interesting plastic sidelines that attracted considerable attention were "planning sets" used by equipment manufacturers to assist the contractor or home buyer in kitchen layout. One set, used by Hotpoint, consists of fabricated miniature stoves, cabinets, etc., made of acetate sheet or other thermoplastic material; another set was molded of polystyrene.

Bulkiest plastic items at the show were probably the laminated materials used for sink tops—not only alone, but with linoleum, aluminum, and sheet steel. Kaiser Fleetwings, Inc., of Bristol, Pa., builders of a hydraulic dishwasher, exhibited a model combination dishwasher and garbage disposal unit mounted directly on a laminated panel and indicated that they were taking a poll among builders to find out what materials would be preferred. Work bases, cabinets, counters, bars, bathroom walls, and store displays were exhibited in high pressure laminate.

Plastic faced plywood—Wheeler-Osgood Co., of Tacoma, Wash., offered its Laminex plastic faced plywood for such use as storage bins, kitchen work surfaces, table tops, counters, concrete forms, boat hulls, freight car linings, etc. It offers two types, one recommended as "a versatile new building material for homes, farms and industry." It is phenolic resin bonded Douglas fir plywood with a synthetic resin-cellulose-fiber plastic surface fused to it. The second material, called Red Label, is more particularly adaptable for interior work where beauty as well as durability is desired.

A number of the newer sinks were equipped with hoses for washing vegetables, rinsing dishes, etc., the spouts of which were molded from phenolic materials. One of the advantages advertised was that the housewife could hold the plastic nozzle and direct a stream of hot water without burning her hand.

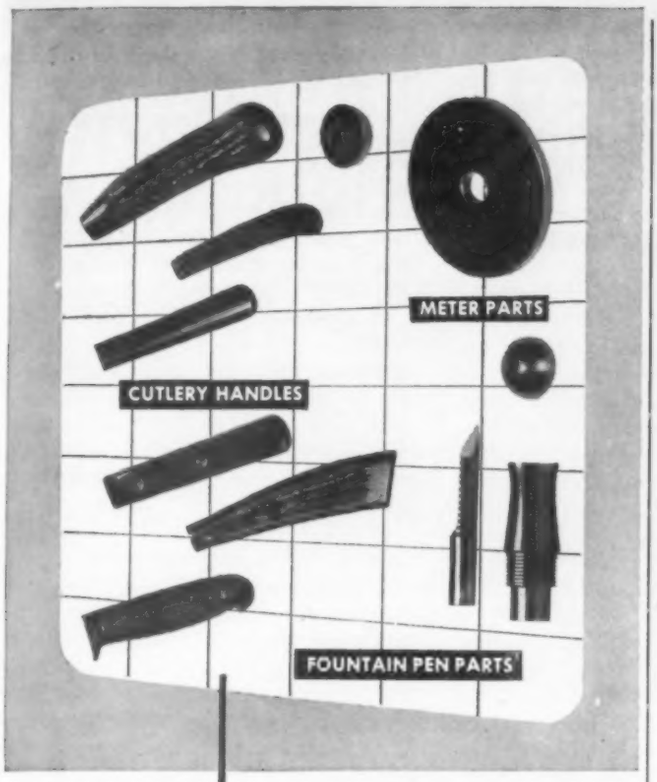
There were a few other molded items such as drawer and cabinet door pulls made from polystyrene, but not much showing of such things as faucet handles, escutcheon plates, and related pieces. Companies who had formerly exhibited these items assert that they were perfectly satisfactory and that even though prices were cut to below those of metal counterparts, customers had been asking for metal and had not yet been switched back to plastics.

Insect screens—The biggest merchandising push at the whole show was Velon and Lumite insect screening. Firestone, in particular, made a big play with spectacular displays that claimed they had done extensive research which had resulted in their offering screen cloth in green, bronze, brown, and aluminum-gray. One of their folders asserted that 150,000,000 sq. ft. of plastic screening would be sold in 1948.

Modernfold doors, accordion-like structures utilizing Du Pont's coated fabrics, were exhibited by New Castle Products, New Castle, Ind.

Prefabricated homes—In the session on prefabricated housing, it was discerned that many of the leading prefabricators are studying plastics carefully. National Homes Corp., Lafayette, Ind., is using exterior panels of $\frac{3}{8}$-in. resin-bonded plywood, faced with a layer of compreg, over which two coats of paint are applied. The company has found this material withstands outdoor exposure satisfactorily. National Homes Corp. reported that it would like, "an inert material which is scratchproof, with a vapor barrier and integral color, available in room-sized sheets." It has worked with honeycomb panels but maintain that they are subject to more dimensional change than non-honeycomb panels.

(Please turn to next page)



The manufacturers of products using these parts investigated and are now using hard rubber.

Is *hard rubber* the best *plastic* for your part or product?

With the development of synthetic formulas, hard rubber, one of the oldest plastics, became one of the newest. Improved formulas are constantly being developed in crude, synthetic and combinations of both. Just the formula you need for your part or product may have been recently developed.

Here are some of the reasons why many manufacturers use hard rubber for parts like those illustrated:

HARD RUBBER:

1. **Withstands oil, water, heat, cold and changing temperatures.**
2. **Resists alkalies, hot soap solutions and most solvents and acids.**
3. **Finishes to lustrous ebony.**
4. **Resists chipping, splitting and cracking under normal usage or when dropped.**
5. **Machines well.**
6. **Molds beautifully.**
7. **Often costs less than other plastics.**

If you are planning or using large quantities of a product that approximates these parts in size, shape, physical and chemical requirements, chances are that our experience and facilities for large volume production will fill your needs at reasonable cost.

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Manufacturers of Rubber and Molders of Plastics

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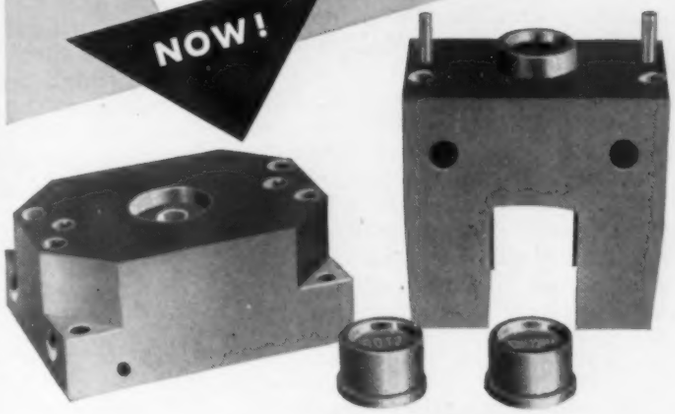

7/16" deep cavities made by Florence Tool & Die Co. from Carpenter *Mirromold* hobbed on a 210-ton press in a single push. No side or back relief on 3" dia. blanks. All hand tool work was eliminated. Push buttons molded by Pro-Phy-Lac-Tic Brush Co. for Federal Electric Products Co. 3/16" deep lettering perfect in size, free from distortion!

● Here's a new Mold Steel that makes hobbing really easy—and fast! Carpenter *Mirromold* (Brinell hardness 90, Rockwell B-55) enables you to push deep, accurate cavities that polish to gleaming finishes. Further, it always responds uniformly to heat treatment. And with *Mirromold* you won't have to scrap expensive molds because of defective steel—its cleanness is *guaranteed!*

Investigate *Mirromold* now! Ask your Carpenter representative for the descriptive leaflet—then start using *Mirromold* for real savings all along the line. THE CARPENTER STEEL CO., 112 W. BERN ST., READING, PA.

Carpenter

WARRANTED CLEAN DIOK SOUND UNIFORM

ELECTRIC FURNACE MOLD STEELS

100% ACID DISC-INSPECTED

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A representative of Gunnison Homes, Inc., New Albany, Ind., pointed out that about 90 to 95% of prefabricated homes are F.H.A. financed and that the manufacturer must stick with known materials until he is sure that others will do the job better. So far, there has not been time to evaluate plastics properly in its type of construction. The firm is looking for a material that will withstand 50 years of weathering.

Molds for short runs

Plastic molds in which intricate shapes can be made without expensive tooling have been developed by Product Development Laboratories, an associate company of Product Technicians, Inc., 65 Broad St., Rochester 4, N. Y. Tolerances of ± 0.005 in. can be held and reverse draft or undercuts easily removed from the mold.

Not intended for high production, the molds offer a method of obtaining a small quantity (1 to 5000 parts) of parts without a large tooling cost. The "Prodell" resins used come in a variety of colors, machine easily, have a low rate of moisture absorption, and are unaffected by organic solvents.

A booklet put out by the Laboratories describes the molds and also gives some practical hints on product design that should interest molders and users of plastic products.

Bus buzzers

Reo Motors is equipping 2000 new buses with Jessall Plastics Corp.'s extruded vinyl Conncord Signal cords as standard equipment for operating buzzers. Motor Coach Supply Corp. of New York, N. Y., is buying 10,000 ft. at a clip for replacement jobs. The Ft. Worth Transit Co., the first customer, has come back for more four times. One bus requires about 60 ft. of cord. Cotton cord is replaced every 3 to 18 months. It has been established that bus cords must maintain a total of eight jerks per mile in a city bus. Conncord Signal cord lowers replacement and maintenance cost.

Conncord Signal cord has a core of 3-ply cotton cord with a 1/32-in. coating of vinyl elastomer and can be extruded at 150 ft. a minute. Temperature of the die at extrusion point is kept at 380°, temperature of the cylinder about 300°.

Bus companies in general have been using buzzer cord with a wire center and braided cotton covering so that it would not shrink under changing humidity conditions. But the wire cored cord frequently bends or kinks from rough handling by customers, and the cotton abrades away from the wire, giving an unsightly appearance. The vinyl-cotton cord eliminates all these disadvantages.

Another vehicle use for Conncord is for trolley bus retriever cords, each of which requires 35 feet.

Other uses—Conncord has many uses other than in buses. It can be furnished in sizes of from 0.045 to ½ in. in diameter and in a variety of colors. One venetian blind customer took 2,000,000 yd. in colors to match his tape.

The larger sizes have been used as halter ropes for show horses, signal lines on ships, and life lines on pleasure craft. The intermediate sizes are in use for dog leashes and as seats and backs for wooden garden furniture. Breaking point of the larger sizes is 600 pounds. Prices range from $23.75 per 1000 ft. of the 3/16-in. cord to $35.50 for the ¼-in. diameter.

Special extruders—The extruders on which these cords are run were specially designed and built by R. S. Jesionowski of Jessall Plastics, who started in business three years ago after several years in the Engineering Dept. of the Plax Corp. He asserts that he can maintain the same capacity with a 2½-in. machine that is ordinarily expected of a 3½-in. machine. No particulars are available except that screw, heat control, and feed hopper differ considerably from the customary extrusion machine. There is no torpedo on the screw.

On these same machines, Mr. Jesionowski has extruded metallic powders containing 83% metal and 17% acrylic binder in rod shape which is used with metalizing spray guns. Of course, such a mixture wears out the screw much faster than plastic compounds.

Animal glue flakes have also been extruded in rods and then chopped into bits that can be more readily mixed with water.

Cork, nylon, silicone rubber, polyethylene, and polystyrene for coil forms have all been successfully extruded on these same machines.

Improved 1-oz. press

Major improvements in its 1-oz. capacity, Model H-200 plastic injection press have been announced by the Van Dorn Iron Works Co., 2685 E. 79th St., Cleveland, Ohio.

A spreader has been added to the heating cylinder, which, it is claimed, reduces the heating cycle by 50 percent. All heating cylinders are hard chrome plated internally, for longer life, less resistance to flow of material, and less corrosion when molding vinyl.

A relief valve set at 1500 p.s.i. has been added to give maximum clamping pressure at all times. This also permits the injection pressure to be separately adjusted without affecting the clamping pressure. A new needle valve has been added to the hydraulic system to increase gage life. Van Dorn advises that the price of its Model H-200 press will remain the same.

Short run shop

A new service covering custom injection molding of sample lots (100 to 5000 pieces) has been announced by F. J. Kirk Molding Co., Clinton, Mass. In its Short Run Shop, a new division of the Kirk plant, special equipment has been installed for short runs. This equipment, together with low-cost precision molds, is expected to make the service useful to merchandisers who can test sales appeal of newly designed products by marketing short runs under actual sales conditions.

FUTURE FILE

There has been considerable talk in this country concerning the possible introduction of Terylene on this continent. This synthetic material was developed in England as a fabric with somewhat similar properties to nylon and announced jointly in 1946 by Calico Printers Assn., Ltd., and Imperial Chemical Industries, Ltd. There has been talk about it as a fabric in England but no wide-scale development. Like some other synthetic fibers, one of the problems has been difficulty in dyeing.

A month ago there was some whispering in the trade that E. I. du Pont de Nemours & Co., Inc., was about to bring out the material as a molding powder in this country, but we can find no evidence to sustain any such claim. At least, it's

Attention Fabricators! Announcing PLYON PF* laminates

for compound curvatures • for maximum draws

Now, for the first time, you can get versatile PLYON laminates in low-pressure, low-temperature, post-forming sheets that will produce compound curvatures and deep draws. These PLYON PF laminates are impregnated with a new thermo-setting resin developed to assure *maximum draw* consistent with their high strength fibreglas cloth fillers. Moreover, this new resin (in an opaque modification) renders the laminate self-extinguishing.

PLYON PF laminates provide fabricators with hitherto unobtainable advantages. All types can be post-formed at extremely low pressures. Tests now being conducted indicate that the maximum limits of draw will not require greater than 25 psi, while simple curves in matched dies demand only negligible pressure over the die itself.

These same tests show that PLYON PF laminates permit faster production because they require shorter heating cycles. For example: only one minute at 325°F. for drawing 2-ply PLYON PF66. All thicknesses can be formed for your test purposes by means of the inexpensive tooling as illustrated.

PLYON PF laminates are produced in all these dimensions:

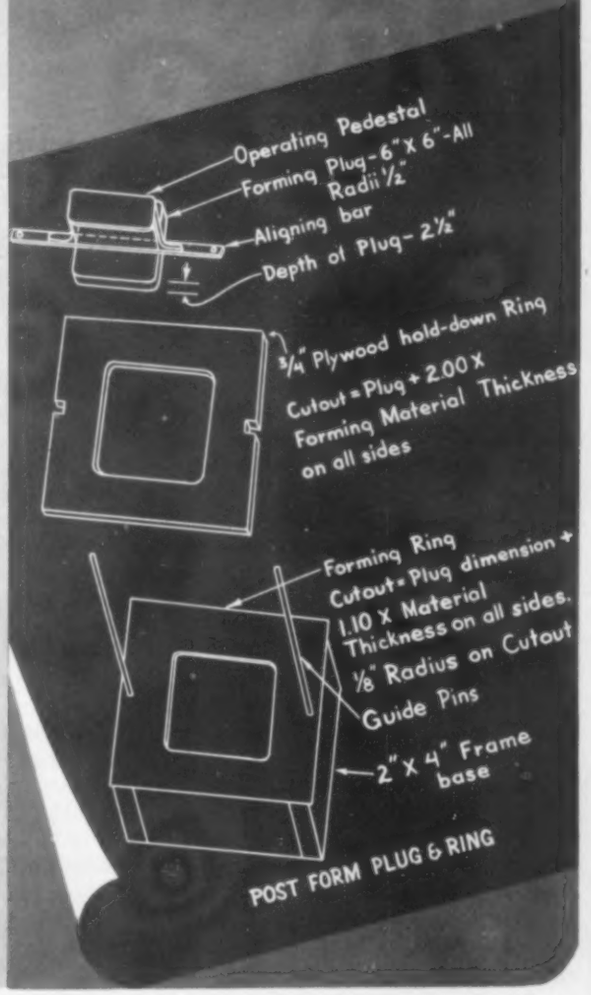
CODE	FILLER	THICKNESS
PF55	2 ply ECC 128 Fiberglas cloth	.015"
PF66	2 ply ECC 162 Fiberglas cloth	.040"
PF666	3 ply ECC 162 Fiberglas cloth	.060"
PF6666	4 ply ECC 162 Fiberglas cloth	.070"

*PF = post forming.

†Reg. U.S. Pat. Off.

ACT NOW

Investigate the important new uses of this remarkable material. Write now to learn how you can test PLYON PF laminates in your own laboratories. And be sure to ask for our descriptive technical data sheet.



Swedlow PLASTICS CO.

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Sole foreign distributors:
OMNI PRODUCTS CORPORATION, 460 Fourth Avenue, New York 16, N. Y.

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several years away, according to authorities we have talked with who ought to know.

Terylene is made from terephthalic acid and ethylene glycol. Terephthalic acid is a co-product obtained when phthalic anhydride is manufactured from petroleum. At the moment, there is a very small amount of phthalic anhydride manufactured by this process in the United States. The other raw material, ethylene glycol, is scarce because most of it is used in the production of permanent-type anti-freeze.

Terylene yarn is stable to light, resistant to mold, has a warm feel, and has high wet strength. It is also resistant to dry-cleaning solvents, bleaching agents, and dilute acids.

An English vinyl processor recently told us that he felt he had gone almost as far as he could in the matter of finding consumer applications for vinyl sheeting and film; consequently, he is making a thorough survey of the use of vinyl sheeting for industrial uses in such applications as coatings for vats and is encouraged enough to believe that this may eventually become one of his product's largest outlets.

Aerosol bombs in a glass container with a nitrocellulose or other plastic coating are reported to be under development. These bombs contain a low-pressure mixture and were originally encased in containers similar to beer cans but it is expected that they will be switched to glass because of the tin shortage.

The most interesting new development for Seal-Peel (ethyl cellulose stripping compound made by the Seal-Peel Inc., Detroit, Mich., is said to be in use by Chrysler in its assembly line. It is reported that line parts are coated with the material and distributed along the assembly line for use in building new cars; when the part is stripped for use, the Seal-Peel is immediately collected and returned to the source where it can be remelted and used again, thus making it an economically feasible operation. Stripping compounds are ordinarily about 25% ethyl cellulose and 75% modifying oils.

Watch for development of printing press rollers to be made from vinyl paste forming resins.

A polyblend latex is on the way. Its advantages are reported to be increased flexibility and other properties such as air drying and strong film strength, no heat required to process, no odor, no migration of plasticizer.

COMPANY NEWS

Carbide and Carbon Chemicals Corp. has opened a sales office in Atlanta, Ga., at 44 Broad St., N.W. Ray G. Kelso has been appointed district manager for the Atlanta area.

Werner Extruded Plastic Co. has moved its sales offices to 295 Fifth Ave., New York 16, N. Y. Its factory is at 42-08 Vernon Blvd., Long Island City, N. Y.

Remington Rand, Inc., is expected to delve more deeply into plastics by implication from the announcement that Lt. Gen. Leslie R. Groves, former head of the Manhattan Project, will become general manager of the company's Scientific Research Div. He will direct the company's research laboratories in Norwalk, Conn., and coordinate a program of scientific research, including applications of physics, chemistry, electronics, plastics, and photography.

The Plaskon Div., Libbey-Owens-Ford Glass Co., has opened a new sales office in Memphis, Tenn. C. J. Fauth, Jr., will be in charge at the Frederick Bldg., 215 Madison Ave., in Memphis.

Monsanto Chemical Co. has established a sales office at 421 Southwest Sixth Ave., Portland, Ore., to handle all Monsanto products. It will be staffed by Baxter Pearson, representing chemical and plastic sales, and W. W. Hayes, in charge of coating and adhesive sales.

Plastene Corp. has moved its sales office from 902 Times-Star Bldg., Cincinnati 2, Ohio, to 188 W. Randolph Bldg., Chicago, Ill.

The American Academy for Plastics Research in Dentistry awarded six plaques for "Meritorious Service to Dentistry in the Field of Plastics" at the recent annual meeting in Chicago, Ill. The doctors honored were E. Byron Kelly, Robert Gillis, E. E. Kraus, LaMar W. Harris, Saul Levy, and LeRoy Kurth.

B. F. Goodrich Chemical Co., Cleveland, Ohio, has announced plans to construct a new $3,000,000 general chemical plant at Avon Lake, Ohio. Various general chemical products now in development or semi-commercial stages will be produced and will supplement the company's present polyvinyl chloride resin, American rubber, and organic chemical products.

Calresin Corp., Culver City, Calif., has opened an East Coast and export office under the name Calresin International at 320 Broadway, Suite 923, New York 7, N. Y.

PERSONAL

James L. Rodgers, Jr., has been appointed general manager of the newly formed Plastics and Resins Div. of American Cyanamid Co. Mr. Rodgers, formerly general manager of the Plaskon Div., Libbey-Owens-Ford Glass Co., brings to the division a wealth of experience in plastics dating back to the original production of urea resins and molding compounds in this country.

The new Plastics and Resins Div. of American Cyanamid is composed of the existing Plastics, Ion Exchange Products, and Coating Resins Depts. These three departments have grown extensively in recent years and their consolidation into a single division has been accomplished to provide more cohesive facilities for research and market development.

R. M. Brosius, formerly sales engineer with the Plastics Div. of Rohm and Haas Co. in the Chicago area, has been appointed general manager of J. B. Products Co., Chicago, Ill., who specialize in metal stamping, plastic finishing and assembling.

John A. Koons, formerly general manager of American Plastics Engineering Corp., Detroit, Mich., is now general manager of Process Mold and Manufacturing Co., also located in Detroit.

Ira H. Gutman, formerly connected with the Gemloid Corp., has been appointed development engi-

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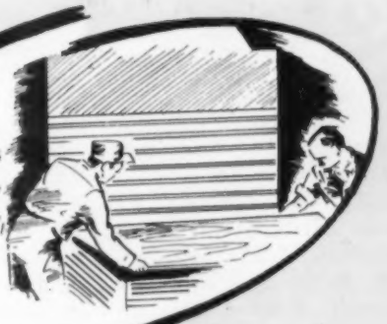

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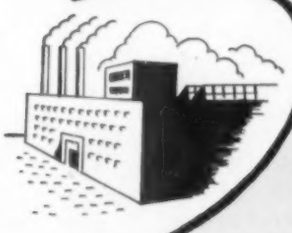

Interlake service features analytic test reports with each delivery, and general consultation at any time on your use of resins. If you use resins investigate Interlake *Resineering*. Write Interlake Chemical Corporation, Union Commerce Bldg., Cleveland 14, Ohio.

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neer by Nebraska Plastics, Inc., Cozad, Nebr. This firm is one of the pioneers in the development of the "Nebraska" tube for siphon irrigation.

Morris Salinger, president of Duranol Products, Inc., Brooklyn, N. Y., has been elected president of the Plastics Club of the United States, Inc. George E. Prescott, of Lewis and Conger, New York, N. Y., was elected vice-president; Miss Jane E. Condit, secretary; and Isadore Engel, of Joseph Brandt Bros., New York, N. Y., treasurer.

Monroe G. Smith has been appointed treasurer and secretary of Plastics Manufacturers, Inc., Stamford, Conn., to replace Ernest Johnson, who resigned.

J. E. Rumpler and **Ed Mike** have been appointed to the positions of assistant general manager and works manager respectively, at Kurz-Kasch, Inc., plastics molders of Dayton, Ohio.

James C. Bailey, Henry E. Griffith, and **Gerard C. Heldrich** have been elected to the board of directors of Plax Corp., Hartford, Conn. Mr. Griffith has also been named secretary. All three men have been executives of Plax for several years. Mr. Bailey is vice-president and research director, Mr. Griffith sales manager, and Mr. Heldrich factory manager.

Joseph Lupo has requested a correction to an item in our January issue. He states that Lupomatic Tumbling Machine Co., Inc., 4510 Bullard Ave., New York, N. Y., is no longer in business and has been succeeded by Lupomatic Industries, Inc.

Andrew Westhead has been appointed district sales manager of the New England district for the General Electric Co., Chemical Dept., with his headquarters at 140 Federal St., Boston, Mass. At the same time, William B. Frackleton was named district sales manager of the Central district of the General Electric Chemical Dept., with headquarters at 840 S. Canal St., Chicago.

Frederick W. Meuschke has been appointed assistant sales promotion manager of Monsanto Chemical Co.'s Plastics Div. Mr. Meuschke was formerly advertising manager of Rumford Chemical Works, Rumford, R. I.

William C. Kirschner has joined the staff of the Plastics and Coatings Dept., Chemical Products Div. of the Goodyear Tire and Rubber Co.

M. A. Self has been elected vice-president in charge of sales and a director of the Bee Chemical Co., Chicago, Ill. Mr. Self has been sales manager of the company since 1947.

F. R. Ward has resigned as assistant section chief in the Process Design Section of the Clinton National Laboratory, Oak Ridge, Tenn., to work as an assistant in the Production Dept. of the Plastics Div., Monsanto Chemical Co., Springfield.

Dr. Herman A. Bruson has joined the Industrial Rayon Corp., Cleveland, Ohio, as head of the High Polymer Research Div. Dr. Bruson is known for his work in the development of acrylics.

C. W. Marsellus has sold his interest in and resigned as president and general manager of Majestic Molded Products, Inc., of Long Island City, N. Y. He has joined Arnold Brilhart, Ltd. as sales manager and has set up a sales office at 480 Lexington Ave., New York, N. Y. Henry Wish has become president of Majestic Molded Products, Inc., and has taken over entire control and management.

John W. Waldron has been appointed consumer products sales manager of Hungerford Plastics Corp., Murray Hill, N. J. He has been one of the corporation's development engineers.

Robert D. Lowry has resigned as research director of the Saran Development Laboratory of The Dow Chemical Co., Midland, Mich., and has accepted a position in the plastics department, Lockport, N. Y., branch office of Dewey and Almy Chemical Co.

Deceased

George J. Crosman, Jr., 52, died suddenly at his home in Fort Lauderdale, Fla. He had retired from active business after selling Plastics, Inc. at Bradley Beach, N. J. Mr. Crosman had formerly been plant manager of the Panelyte Corp., Trenton, N. J.

HENRY J. KASCH, Sr.

With the death on March 19, 1948, of Henry J. Kasch, Sr., the plastics industry lost a leader of great ability. At the time of his death, Mr. Kasch was vice-president of Kurz-Kasch, Inc., Dayton, Ohio.

A member of Plastics Pioneers and fourth president of the Society of the Plastics Industry, Mr. Kasch contributed widely to the advancement of molding techniques in particular and of tooling and engineering procedures in general.

Born in 1885, Mr. Kasch first entered the plastics field in 1904 by joining the Celluloid Co. and later became one of the first to mold Bakelite. With the late Chris Kurz he formed Kurz-Kasch, Inc., in 1918 an organization which was destined to become one of the country's largest plastics molding companies.

Meetings

April 19-23—American Chemical Society national meeting in Chicago, Ill. General headquarters will be the Stevens Hotel.

April 26-30—Annual Packaging Exposition, Public Auditorium, Cleveland, Ohio.

May 20-21—Annual meeting of the Society of the Plastics Industry, Hotel Ambassador, Atlantic City.

May 27-29—Annual meeting of the Society for Experimental Stress Analysis, Hotel Roosevelt, Pittsburgh, Pa. Inquiries should be addressed to the Society at P. O. Box 168, Cambridge 39, Mass.

Sept. 27-Oct. 1—Third National Plastics Exposition, Grand Central Palace, New York, N. Y.

June 21-25—Annual meeting of the American Society for Testing Materials, Detroit, Mich. Book-Cadillac, headquarters hotel.

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WANTED: INDUSTRIAL ENTERPRISE. Large financially powerful diversified organization wishes to add another enterprise to present holdings. Cash paid for capital stock or assets. Existing personnel normally retained. Strictly confidential. Box 1230, 1474 Broadway, N.Y.C.

FOR SALE—Compact Molds for injection molding. For molding large round compacts and other styles. Some styles with tools, puffs, sifters, cartons and parts. Will sell cheap. Affiliated Enterprises Co., 85 Van Braam St., Pittsburgh 19, Penna.

FOR SALE

Hydro Pneumatic Accumulator, 13 Gal. 3500#. 25 Ton "C" Frame Type. High Speed Self Contained Hyd. Press Ball & Jewell Rotary Cutter. Model R Stokes Tablet Machine. 50 Ton Press with 18" x 18" Electric Plates. 100 ton 20" x 20" press. Racine Pumps, Boosters, Valves, Logan Pumps, Valves. Self-Contained — 200 H.P. 78 Gal. 3000# Pump. 200 H.P. 200 Gal. 1500# Pump 18" x 15' Accumulator 1500#.—15" x 11' Acc. 400-2000". 6" x 9' Accumulator-2000#. 300 Ton Press 20" Ram, 8" Stroke. 24" x 20" Platen. 500 Ton—1000 Ton Hobbing Press—Hele Shaw Variable Pressure 33 GPM 2500#—Vickers Oil Pumps 17 GPM 500 to 1000#. Elmes Horo. 4 Plunger 6—Gals. 5000#.—Stillman 12" x 12" Laboratory Presses. Aaron Machinery Co., 45 Crosby St., NYC.

WANTED: PLASTIC Scrap or Rejects in any form. Cellulose Acetate, Butyrate, Polystyrene, Acrylic, Vinyl Resin, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding and magnetizing. Reply Box 318, Modern Plastics.

ADMINISTRATIVE — PURCHASING Available:—Man experienced in Trading Plastics and Plasticizers, Production Control, Warehousing, Import and Export presently employed seeks position with ultimate goal of Purchasing Agent. Degree Business Administration. New York area location preferred. Reply Box C613, Modern Plastics.

FOR SALE: 500 ton Hydr. Molding Press 42" x 48", Field 500 ton 25" x 30", Francis 200 tons, 24" x 18", Thropp 175 ton 36" x 36" —6 opening. Also presses 20 to 250 tons from 12" x 12" to 36" x 36" & 40 ton Broaching Press. Watson-Stillman Hor. 4 Plgr. 1" x 2" x 4" H. & L. Pressure Pumps; HPM 1¾" x 9" vertical triplex 10 GPM 2700 lbs; 7 Hydr. Oil Pumps, Vickers, Oilgear, Northern, etc., Elmes 1" x 4" & 1⅛" x 4" hor. 4 plgr. 5 to 8 GPM 4500 lbs. & 5500 lbs; Elmes 2" x 6" hor. 30 GPM, 2500 PSI.; Rumsey 4½" x 8" vert. Triplex 65 GPM 900 lbs; Elmes 2½" x 4" hor. 17 GPM 850 lbs; Hydr. Steam Pumps; Low Pressure Pumps 150 to 600 lbs.; Hydr. Accum; Stokes type 200 Automatic Molding Press, Stokes Rotary Preform Tablet Machines 1-3/16", 1⅛" and ⅝", also single punch; Injection molding Machines 2 oz. to 12 oz.; Baker Perkins Jacketed Mixers 100, 50, 20 & 9 gals. capacity; New Rotary Cutters; Rubber Mills; Calenders, Banbury Mixers, etc.; Heavy Duty Mixers; Grinders; Pulverizers; Gas Boilers etc. PARTIAL LISTING. WE BUY YOUR USED MACHINERY, STEIN EQUIPMENT CO., 90 WEST ST., NEW YORK 6, N. Y. WOrth 2-5745.

POSITION WANTED: Experienced in all phases of production, mold design, costs and maintenance of injection, compression, transfer molds and equipment. Over 15 yrs' exp. in plastic molding. Box C591, Modern Plastics.

PRODUCTION CHEMIST—with experience in the manufacture of Phenolic moulding powder. Must have ability to supervise men and get production results. Excellent opportunity for right man. Plant located in Middle West. Reply Box C507, Modern Plastics.

FOR SALE—1—Watson Stillman Hydro-Pneumatic High and Low Pressure System, complete, 3000#; 12—Baker Perkins 100 gallon Plastic Mixers; 1—12" x 12" Press 7" Ram, Steel Heated Platens and Hand Pump attached; 2—24" x 24" Adamson, 10" ram, 2—opening Hydraulic Press; 2—La Pointe Hydraulic Pumps, 150 G.P.M.—2000 lb. pressure direct motor driven to 125 HP AC motors; 1—French Oil Hydropneumatic Accumulator; 1—14" x 24" Press, 9" ram; 2—Royale #3 Perfected Tubers; 1—Royale #1½ Perfected Tuber; 1—16" x 42" Thropp Mill; 2—B & J #1 Rotary Cutters; 1—Cavagnaro 2 cylinder 10" diameter Vertical Hydraulic Extruder; 1—Devine #11 Vacuum Shelf Dryer, 17 shelves heated 40" x 42"; 1—Farrell 6" x 12" 2-roll Rubber Mill; 1—48" x 48" 3—opening Hydraulic Press, 4—10" diameter rams, 300 tons; Dry Powder Mixers; Pulverizers; Grinders; etc. Send for complete list. Reply Box C581, Modern Plastics.

FOR SALE Injection Molding Machine, DeMattia vertical two ounce press, approximately seven years old. Can be seen in operation. Very attractive buy $2,000. Reply Box C587, Modern Plastics.

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HYDRAULIC PRESSES, 30"x52", 24" ram, 700 tons; 30" x 30", 20" ram, 1000 tons; 30" x 30", 17" ram, 340 tons; 20" x 24", 19" ram, 350 tons; 42" x 42", 16" ram, 250 tons; 36" x 36", 16" ram, 250 tons; 36" x 36", 12" ram, 141 tons; 36" x 52", 14" ram, 385 tons; 26" x 30", 15" ram, 177 tons; 20" x 20", 13" ram, 166 tons; 24" x 26", 10" ram, 118 tons; 19" x 24", 10" ram, 78 tons; 23" x 17", 8" ram, 75 tons; 22" x 15", 8" ram, 75 tons; 15" x 15", 8" ram, 75 tons; 12" x 12", 7½" ram, 50 tons; 12" x 12", 6½" ram, 42 tons; 8" x 9½", 4½" ram, 20 tons; 16" x 16", 3½" ram, 12 tons; New Dual Pumping Units; HPM Triplex 1½ GPM 2500#, Robertson Duplex 1-2/3 GPM 4000#; Worthington 2½ GPM 4000#, W&S Duplex 1 GPM 2500#, 4 plunger 6 GPM 2000#; Laboratory Presses all sizes; Laboratory Mills, New Units 6" x 12" M.D., 10" x 24" and 16" x 30", 36", 40" and 42" Mills with Drives; Extruders, Plastic; NRM 1½" and 2½" units; W&P unjacketed sigma blade 100 gal. Mixer; Preform Machines; Stokes R, Colton 5T; Hydro-Pneumatic and weighted type Accumulators, etc. HIGHEST PRICES PAID FOR YOUR USED MACHINERY. Universal Hydraulic Machinery Company, 285 Hudson St., N. Y. C. 13.

PROMINENT MEXICAN molder will manufacture and distribute your products in Mexico. Lester-Phoenix 6 oz. injection and numerous compression presses available. Will buy or rent suitable molds. Any reasonable proposition considered. Write Industria Metalica Mexicana, S.A., Apartado No. 1822, Mexico D. F. Mexico.

WANTED: INFORMATION AND PRICES ON USED, operating 8 oz. or 12 oz. Reed Prentice or Lester injection molding machines. Reply to C. R. Hibbard, 559 South East St. Frankfort, Indiana.

FOR SALE—Electronic Sealing equipment. 2 RCA Radio Frequency Generators Model 2BH, 2 RCA 14" die sealers. Also several Kabar High Frequency generators. This equipment is in excellent condition having been used and all or any part thereof is offered at substantial discount off list prices. Box C594. Modern Plastics.

FOR SALE—HYDRAULIC PRESSES 1—Watson-Stillman 225 ton, 30" x 28" platen, 10" ram; 3—Southwark 225 Ton, 31" x 19" platens, 16" ram; 1—Burroughs 150 ton, 28" x 13" platens, 2-9" rams; 2—Baldwin-Southwark 110 ton, 24" x 18" platens, 11" ram; 3—Watson-Stillman 60 ton, 12" x 12" platens, 8" ram; 1—12 ton, 15" x 15" platens, 3½" ram; 1—HPM Hydro-Pneumatic Accumulator, 650", 4' 6" x 12' tank with IR 30 Compressor; 2—Steam Driven Hydraulic Pumps, 15 and 30 GPM, 3000# and 5000#; 1—Baker Perkins 100 gal. Jacketed double arm Mixers; 25—Stokes Preform Presses "R", 2½"; "T", 1½"; 2—Stokes DD2 Rotary, 1-3/16"; RD4 Rotary, 1"; Colton Rotary, 35 punch, ¾"; Day Readco, from 4 to 150 gal. double arm Mixers; 2—Ball & Jewell #0 and #1 Rotary Cutters. BRILL EQUIPMENT COMPANY, 225 West 34th St., N. Y. 1, N. Y.

WANTED—SCRAP, Lucite HM129 and clear acetate. Box C583, Modern Plastics

FOR SALE: Angle Molding Hydraulic Press Watson-Stillman, suitable for Split Molds and for Molding Complicated Parts by the transfer method. 3 horizontal double acting rams, 13½", 8" and 6" arranged in "T". Reply Box C132. Modern Plastics.

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TECHNICAL ADVISER. 5 yrs' exp. exclusively in low pressure thermosetting field; 3½ years in contact pressure continous lamination. Looking for right connection to turn over many new ideas in uses and new equipment. Box C612, Modern Plastics.

WANTED PLASTIC INJECTION mold designer and piece part estimator. Experienced. Excellent starting salary. Replies held confidential. Chicago area. Box C611, Modern Plastics.

AVAILABLE RESEARCH CHEMIST: Proven technical ability. Excellent background in thermoplastic extrusion, color matching and control, die design and product covering and development. Past experience includes 7 years plant set up, personnel supervision, purchasing and fabrication. Presently employed: will consider any interesting and promising position in production development or technical service. Box C614, Modern Plastics.

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Manufacturer with hardware, electrical, house furnishings and other outlets interested in securing new products to manufacture and distribute through its national sales organization. Metal stamped or molded items preferred. Box C605, Modern Plastics.

TURKEY Plastic concern in Istanbul interested in association with enterprising and credited industrialist wanting to start business in Turkey, in the fields of Compression Injection, Extrusion or Calendering. Also wishes to communicate with Mfgs of Molding Powders, resins, dyes, related chemicals and materials; machinery and equipment for plastics industry. Address: Kayhan Caglayan, P. K. 1300, Istanbul, Turkey.

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IDEA MAN—Engineer, long practical exp. with fundamental industrial patents sold to some of the largest firms, has now gone into plastic field. Available are approved household, toys, games, educational items. Can develop entirely new medse., not just variations, or reduced copies of existing products. Box C603, Modern Plastics.

NEW YORK SALES—Progressive firm doing consultation and design work offers its services to custom molders, extruders, and laminators requiring sales representation in N. Y. and Metropolitan area. Valuable contacts. We are equipped to prepare estimates and to aid your prospects in engineering problems. Commission basis. Box C584, Modern Plastics.

GRADUATE ENGINEER for World-Wide Plastic Technical Service. Unusual opportunity for young man free to travel approx. 9 mos. ea. yr. would be spent in contacting plastic customers on their moulding problems in all sections of world outside No. Amer. Applicant must have good sales personality and number of yrs. practical exper. in Injection Plastic Moulding, preferably with additional design exper. Write, giving in first letter, full details, including age, educ., employment record, individuals to contact for references, salary expected, languages spoken, etc. Dow Chemical of Canada, Ltd., 204 Richmond St., West, Toronto 1, Canada.

CUSTOM INJECTION molding: $2.70 per hour 4 oz. machine, $3.15 - 8oz. on steady run. Complete mold making and maintenance. Reply Box C585, Modern Plastics.

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Plastic Extrusion Plant
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Complete and Operating
Industry Leader, National reputation. Excellent buy for interests seeking expansion in plastic field.
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6" PLASTIC EXTRUDER
FOR SALE
New, Unused—Immediate Delivery
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SALES AGENT WANTED on commission base by long established Custom Molding Concern in Rhode Island 50 to 300 Ton Compression Presses, 2 oz. Injection Press. Box C588, Modern Plastics.

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Sheet acetate trimmings, etc. from manufacture of transparent acetate boxes. Plain (uncontaminated) and also some with printing, kept entirely separate. Substantial quantities; steady supply. Send for sample lots gratis.
Weinman Bros. Inc., 325 N. Wells St., Chicago, 10, Ill.

FOR SALE: Unused Singer Sewing Machine Company plastic sealing machine Model #AG 592442 Motor #909724. Equipped with table and stand. Will sell at substantially reduced price. Box C589, Modern Plastics.

FOR SALE: All types of plastic scrap. Vinyls, Celluloses, Acrylics, Polyethylene, Saran, Styrene. Uncontaminated, assorted. Also surplus lots of resins and plasticizers, Reply Box C590, Modern Plastics.

WANTED
Lester Injection Molding
Machines
4 oz. capacity Model LPM1 or later
Olpeco, Inc., 115 Fourth Ave., AL 4-1293.

PLEXIGLAS® FOR SALE
Save up to 50% on Rohm & Haas Plexiglas Sheets size 42" x 40" x .125" #260 Green—approx. 70 sheets per case. Case lots 69¢—lower on quantity.
KELLY & CO. — Dept. 5
2007 Olive St., St. Louis 3, Missouri

FOR SALE Four injection molds for established Christmas ornaments. Molds are 16-cavity, 2 18-cavity, and one 24-cavity and are fitted for machines 8-ounces or larger, Reed, H.P.M. or Lester. Well built and in good condition. Priced right. Write boxholder 215, Rivera, Calif.

FOR SALE—Extruded Belting (Vinyl) for apparel wear and other extruded sections. Also compounded resins in granular form 60% VYNS and 40% DOP, clear, no fillers added. Suitable for sheeting and extrusion. Reply Box C604, Modern Plastics.

FOR SALE: 750 lbs. clear acetate extruded strip, ⅝" wide x .030" thick in 5 ft lengths. Half price. Reply to Teal Molding Company, Inc., P. O. Box 3115 Westville Station, New Haven 15, Connecticut.

PLASTIC
For Sale: 2500 ft. ⅜" Black Rod; 6500 ft. Micarta Rod, canvas base, natural from ¼" to ¾"; 1000 ft. Pleenolic Tube, natural and grey, 5/16" to 13/16" O.O.
KELLY & CO. — Dept. 5
2007 Olive St., St. Louis 3, Missouri

WANTED: Superintendent with extensive experience in compression, transfer, and injection molding, who is also production conscious. State experience and salary desired. Plant in Lake Erie Area. Reply Box C599 Modern Plastics.

PLANT MANAGER: With KNOW HOW experience in all phases of transparent plastic acetate container fabrication, desires position in same or allied field with a well established, progressive organization. Also qualified as plastics packaging consultant. Reply Box C600, Modern Plastics.

INDEN BISELERS (Manufacturers' Representatives) Post Box 1595, 247 China Bazaar, Madras, India, Invite inquiries from manufacturing firms of all Plastic articles—novelties, etc., for representing their firms in South India. For references: Please apply: The Bank of Montreal, New York.

FOR SALE—Impco Horizontal Injection-Vertical Compression Plastic Molding Machine—Model VF 822—12 oz. capacity with 50 to lower compression cylinder—Plgr. dia. 3.125"—15,000 p.s.i.—complete with motor and electrical panel controls—9,000 watt (#2) circulating unit with riser pipes for cooling molds—New condition—Used 6 months for Research and Experimental purposes only. See pg. 29, Jan. '48 Modern Plastics for similar machine. Solar Aircraft Co., 18th & Grand Ave., Des Moines, Iowa.

MFRS.—NEW YORK concern offers fine and intricate work on Steel Type and Matrices. Gears and Cams profiled to close tolerances. Dials and Gauges produced accurately in metals and plastics. "Duotone", two color name plates and signs in all plastics. Lucite point of sale signs. Advertising Specialties imprinted. C595, Modern Plastics.

FOR SALE: Two (2) self-contained straight ram hydraulic presses; one (1) 14" ram, the other 11" ram, complete with pullback rams, N. Y. Air Brake Pumps, variable pressure up to 3000 lbs. C597, Modern Plastics.

FOR SALE
2 Complete Injection Units in good condition with cylinder and special heating chamber for Lester 4 oz. machine. Olpeco, Inc., 115 Fourth Ave., N. Y. AL 4-1293.

PRODUCTION MAN: 32, Ch.E. '36, 10 yrs. progressive responsibility manufacture of phenolics. Capable designing new plant, assuming full charge production of resins and molding compounds. Experienced in development, process investigation, control. 2 years manufacture thermoplastics (cellulose acetate, polystyrene). Exc. references available at once. C593, Modern Plastics.

PLASTIC MOLDING ENGINEER WANTED for new injection plant in midwestern middle sized town. Reply stating age & education, exp., salary requirements, etc. Write C. R. Hibbard, 559 S. East St., Frankfurt, Ind.

FOR SALE: One two (2) cavity flouresceni lamp shade mold for 14 watt, 15" bulb. $4500.00. Box C596, Modern Plastics.

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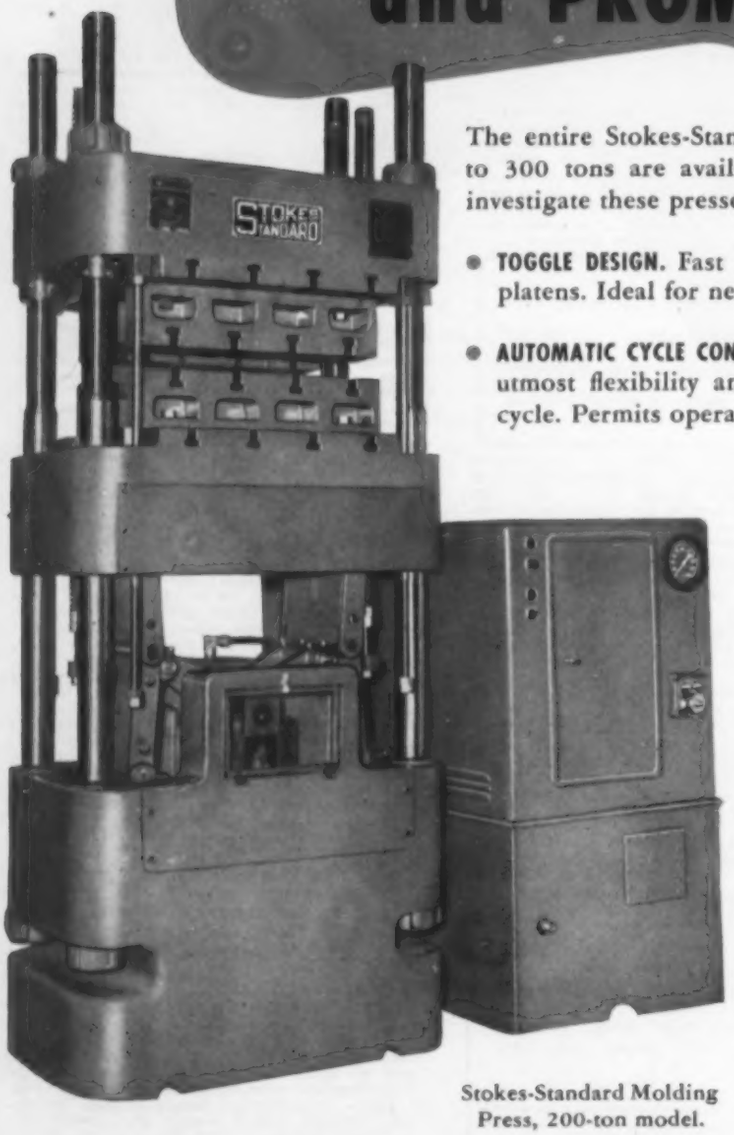

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(*Please turn to page* 249)

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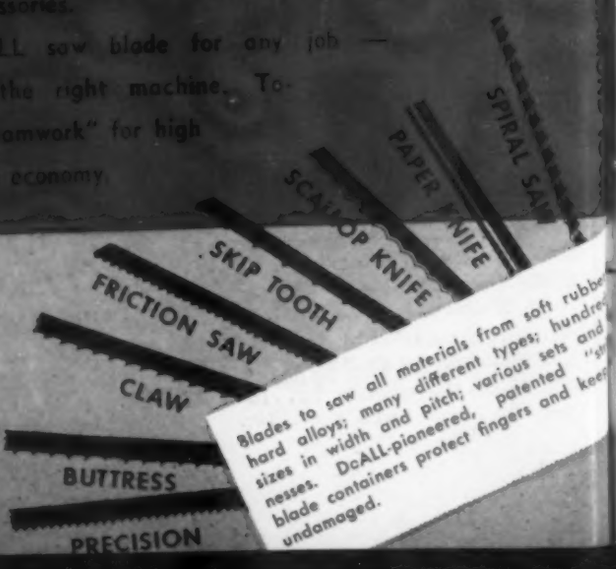

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A. Definitely, yes. Not only does Custom Injection Moulding lend itself particularly well to volume production, but our plant is the largest in the East devoted exclusively to Custom Injection Moulding.

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